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The Comparative Effects of Two Types of Photographic Visual Supports on the Acquisition of Independent Performance of Multi-Step Tasks by Students with Autism Spectrum Disorders

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The Comparative Effects of Two Types of Photographic Visual Supports on the Acquisition of Independent Performance of Multi-Step Tasks by Students with Autism Spectrum Disorders

by

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DEDICATION

To Chloe, who sat beside me through all the hours of work.

To Brenna, who had patience with me.

To my Mom for always encouraging me to finish.

To my Dad looking down from Heaven; I know he’s proud.

And to Jeff, my childhood sweetheart and best friend.

ABSTRACT

THE COMPARATIVE EFFECTS OF TWO TYPES OF PHOTOGRAPHIC VISUAL SUPPORTS ON THE ACQUISITION OF INDEPENDENT PERFORMANCE OF MULTI-STEP TASKS BY STUDENTS WITH AUTISM SPECTRUM DISORDERS

by

Cynthia Denise Golden

This study uses a single subject adapted alternating treatment design to examine the comparative effects of two types of visual supports. Photographic visual supports that depict only the materials in the completed step and photographic visual supports that depict the student using the materials to complete each step were examined as to their comparative efficiency on the acquisition of independent performance of multi-step tasks by students with autism. The study expands the body of literature and fills a gap in the research of visual supports, which is one of the most widely accepted, research-based forms of intervention used with subjects on the autism spectrum. The gap is in the lack of comparative studies using two types of static photographic visual supports. The results indicated a slight difference in the overall efficiency between the two types of visual supports as indicated by the *materials* visual support meeting criteria prior to the *model* visual support. The data indicated a large and immediate change from baseline to intervention phase in all subjects and across all tasks. All subjects were able to maintain acquisition and mastery of the skill regardless of the task used across several subsequent sessions. The subjects also generalized the use of the most efficient to a different task.

Keywords: autism; visual supports; adapted alternating treatment design.

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CHAPTER 1

INTRODUCTION

A visual support is a picture supported aid typically used for students with autism. Visual supports assist students with both communication and the basic understanding of instructions through the illustration or photographic depiction of an object or the step to a task. Visual supports can be created in several different ways depending upon the needs of the students using them. Visuals supports can be created by using an object, black-lined drawing, colored illustration, photograph, or video. Modern day technology has allowed for the expansion of visual support types moving from static illustrations and photographs of objects to the use of real life video to depict students modeling steps to tasks. The current use of modeling, specifically video modeling, has been the focus of numerous research studies (Mechling & Ortega-Herndon, 2007; Hammond, Whatley, Ayres, & Gast, 2010; Cihak, Alberto, Taber-Doughty, & Gama, 2006).

But with the advancement of technology, which promotes the use photographic or video depiction of students modeling steps to a task comes a question as to the actual difference in efficiency. Does the move from using a more simple visual support depicting objects used in a task have a greater impact on a student's ability to perform tasks independently than the more complex visual depicting a subject modeling the desired behavior? Are the more time consuming photographic visual supports depicting students modeling steps to a task actually more efficient enough to warrant the increase in time required for their creation? I hope to add to the field of

research by further examining the comparative efficiency between the use of photographic visual supports of materials used in a completed step to a task and the photographic visual supports using students modeling steps to a task.

Background

The skills needed to communicate and socially interact have a dramatic effect on the ability of a student who has been diagnosed with autism to independently function in both school and community settings. Based on the definition by the Autism Society of America (Autism Society of America, n.d., para.1), *autism* is a developmental disability that typically appears during the first three years of life and is the result of a neurological disorder that affects the normal functioning of the brain, impacting development in the areas of social interaction and communication skills.

The Diagnostic Statistical Manual IV-TR (DSM IV-TR) (2000) outlines the specific criteria needed to make a diagnosis of a*utism*. The DSM IV-TR states that the criteria for an *autistic disorder* include qualitative impairments in both social interaction and communication along with restricted repetitive and stereotyped patterns of behavior, interests and activities. The DSM IV-TR criteria also include delays or abnormal functioning in at least one of the following areas with onset prior to age three years:

1) social interaction
2) language as used in social communication
3) symbolic or imaginative play

Additionally, compared to most neurotypical students (i.e., typical functioning students), students with autism do not typically present with the ability to appropriately interpret basic sensory stimuli. This inability to interpret their surroundings, compounded by the difficulty with

verbal and nonverbal communication, lends itself toward the student becoming less able to function at an independent level in school and community settings.

Planning and providing for educational interventions needed by students with autism typically begins with providing structure to the setting in addition to creating a climate that is organized and controlled. According to an early study by Schopler and Mesibov (1994), a structured teaching environment for students with autism begins with the creation of a clear and minimally distracting physical environment. A structured teaching environment can be described as one that is organized and makes use of visual supports or pictures to symbolize abstract concepts in the environment enabling students with autism to better understand and predict what is required of them in the setting. This structure helps to maximize the student's ability to independently function in the environment while minimizing the need for adult prompts or assistance (Schopler, Mesibov, & Hearsey, 1995).

In order to determine the most appropriate interventions to use in the classroom setting based on the characteristic needs of the student, the National Autism Center (NAC) (2009) prepared a report that examined the interventions used in the education of students with autism. The NAC stated that the development of children with autism can be significantly enhanced by the delivery of carefully planned and data driven instruction that targets specific areas of communication, social skills, play, cognition and independence. National Autism Center (2009) report outlined 11 of the established best practice interventions used to enhance the performance of students with autism. Two of the following established practices had a direct impact on my research:

- Modeling: These interventions are dependent upon adult or peer demonstration of a target behavior. This should result in an imitation of the target behavior by the student with

autism (Apple, Billingsley & Schwarz, 2005; Blew, Schwartz & Luce, 1985; Buggey, 2005; Buggey, Toombs, Gardener, Cervetti, 1999; Charlop, Schreibman & Tryon, 1983; Krantz & McClannahan, 1998; Murzynski & Bourret, 2007; Nikopoulou & Keenan, 2007).

- Schedules: The NAC referred to the use of a visually supported, task analyzed or serial list of activities or steps required to complete a specific task as a schedule. These schedules utilize pictures, words or a photograph to communicate the requirements of a task (Bryan & Gast, 2000; Hall, McClannahan & Krantz, 1995; Hume & Odom, 2007; Krantz, MacDuff & McClannahan, 1993; O'Reilly, Sigafoos, Lancioni, Edrisinha & Andrews, 2005).

In recent years, the use of modeling and visual schedules has been further enhanced by technology. Video modeling, defined as the use of short video clips of students performing tasks, is one method that is bringing these two interventions together. Video clips have been used to teach students the sequential method to completing specific tasks. The foundational research for video modeling is based on the early work of Bandura (1969, 1977), who stated that children typically learn through observational learning or, in other words, by watching others complete the same task.

Recent research (Hammond, Whatley, Ayers, & Gast, 2010) indicates that the us e of modeling, specifically the use of video clips depicting students modeling the steps to a task, has been shown to be effective in teaching students with moderate intellectual disabilities to use certain portable technological devices such as an *iPod Touch*®. Other studies that have employed modeling techniques, using both static photographs and video, included teaching students with disabilities to use an ATM (Alberto, Cihak, & Gama, 2005), to cook simple foods (Shipley-

Benamou, Lutker & Tauman, 2002), and to complete vocational tasks (Mechling & Ortega-Hurndon, 2007).

Stromer, Kimball, Kinney & Taylor (2006) used static photographic visual supports and modeling paired with computer technology and the *Microsoft® Powerpoint® program* as a topic of research (Stromer, Kimball, Kinney & Taylor, 2006). In 2007, the researchers used the study by Stromer et al. (2006) to develop a research project based on this concept. The project was designed to investigate the effects of a static photographic visual activity schedule created from student modeling photos on the ability of a subject with autism to independently complete an academic task. The results from this study showed a marked increase in the subject's ability to independently complete a workbox task using the visual schedule created from modeling photos.

Statement of Problem

I completed a preliminary study (Golden, 2007) examining the efficiency of using a photographic visual schedule that included the use of a computer based program. This study used photographs of a subject completing steps to a task and the subject was to maneuver through the visuals using a touch screen and the *Microsoft® Powerpoint®* program. The results were positive indicating an increase in the subject's ability to perform steps to a task with a decrease in teacher prompting. This study showed the use of photographic visual supports using a model of the subject completing the steps to a task to be efficient. But in the study I noted several issues. These include the following:

- the lack of portability with the visual support being computer-based
- the complexity of creating a visual schedule using a *Microsoft® Powerpoint®* program (Stromer, Kimball, Kinney & Taylor, 2006) since it requires prerequisite knowledge of the computer program

- the choppiness in the use of the visual support in that it required the student to go back to the computer at the end of each step of the task
- the difficulty with obtaining computer technology, a touch screen, and the *Powerpoint*® program in the classroom
- the time required to create the visual schedule using students modeling photographs

At the conclusion of the preliminary study, I wanted to begin using a visual support system that provides for the same type of efficiency found in my preliminary study but one that combats all of the issues, in particular the one regarding the time required for the creation of visuals using student models. These issues helped guide my further review of research.

The overall use of photographic visual supports has been thoroughly researched (Dalrymple, 1989, 1995; Hume, Loftin, & Lantz, 2009; Thinesen, & Bryan, 1981; Wacker, & Berg, 1983; Savner, & Myles, 2000; Quill, 1995; McClannahan, & Krantz, 1999) and found to be an effective intervention for students with autism. The use of modeling visual supports using both computer and video technology has been successfully researched and found to be effective as an intervention used in the classroom. The gap in research was a comparison of the effectiveness of using a simple static photographic visual of just the materials used in a task versus a more complex static photographic visual of a student modeling the step to a task.

The overall question for my research study focused on the difference in efficiency between two types of photographic visual supports used by subjects with autism to independently master and complete steps to a task. The two types of visual supports that will be compared are described as follows:

- *Model*: is a visual activity schedule created from a serial group of photos depicting a subject modeling the completion of each step to a task that has been analyzed and

divided into discrete steps. Each discrete step of the task will have an individual photo. In each photo, the subject will be staged to appear as if he or she is completing the task.

- *Materials*: is a visual activity schedule created from a serial group of photos showing only the materials used in each step of a task that has been analyzed and divided into discrete steps. Each photo will depict the completed step showing only the materials and not the subject model.

Research Question

Through a review of educational literature and through experience in working with students on the autism spectrum, some pertinent questions helped guide the direction of my research to this specific area. These guiding questions were

1) Are there specific types of visual supports that are more efficient than others in working with students on the autism spectrum?
2) Do students with autism respond better by seeing themselves model steps to a task rather than viewing only the materials from a task?
3) Can students with autism use a visual support created from photographs of him or her completing the steps to a task in order to independently complete the sequence without adult prompts or assistance?

Using these guiding questions as a foundation I devised the overarching research question for the study. The research question for the study is as follows: *What are the comparative effects of using a photographic visual support that depicts only the materials needed to complete each step in a task and a photographic visual support that depicts the student using the materials to complete each step on the acquisition of independent performance of multi-step tasks by students with autism?*

The following are additional sub questions that will answered by the study's data.

1) How large will the difference be in the efficiency of the two types of visual supports in assisting subjects to independently complete the sequential steps of a task in order to reach set criterion?
2) Which will be found as the most efficient type of visual support in the acquisition of independent work skills on multi-step tasks?
3) Will the more efficient visual support demonstrate generalization to other types of tasks?

Purpose and Significance of the Study

The significance of this study is the addition of empirical data to fill a gap in research. This study will add to the field of research by examining the comparative efficiency of two types of photographic visual supports using static depictions of student modeling completion of a task and photographic depictions of the materials used in the completed steps to a task. This research may or may not lend itself in support of the current trend of using visual modeling with students on the autism spectrum.

Another significant feature of this research is that it will compare the efficiency of interventions that are designed to remedy the issues found in my preliminary study using a computer based visual schedule. These issues included the lack of portability of computer based intervention; prerequisite requirement of knowing how to use the *Microsoft*® *Powerpoint*® program; reliance of computer technology; the lack of fluidity in requiring the student to return to the computer after each step; and the time required to create *Powerpoint*® visual schedules.

Because there is more complexity and time involved in the creation of modeling visuals than visuals of objects only, there is significance in determining if the use of visual supports using *modeling* photographs is actually more efficient. Classroom teachers may weigh the

requirements and resources needed for the creation of visual supports by the research that documents their comparative efficiency. If one is more time consuming but less efficient, the teacher may consider another option. The significance was to determine if there was enough of a difference in efficiency to warrant using an intervention that is more complex and more time consuming to create.

Audience

The intended audience for this research is the group of educators who work with students diagnosed with an autism spectrum disorder. These educators included teachers, paraprofessionals and therapists. Administrators and those who help to determine the types of interventions to be implemented with students receiving special education services were also important members of the research audience.

Theoretical Framework

In this section I am going to chronologically present the progression of theoretical background for autism. Specifically I am going to review Behaviorism, which serves as the theoretical framework upon which this study is based. Within the area of Behaviorism, there will be three concepts that will be discussed and these are: *visual supports*, *executive functioning* and *central coherence*.

Behaviorism

The theoretical framework for this research was grounded in the study of Behaviorism. Skinner's (1957) work in behavior included his book *Verbal Behavior*. This is a seminal piece of educational literature, but also quite controversial. Skinner's (1957) work was considered to be radical and unproductive (Rosenwasser & Axelrod, 2001) by some, while others thought it brilliantly re-oriented the understanding of language. Skinner (1957) described two types of

conditioning: classical and operant. *Classical conditioning* is one in which a natural occurring stimulus is paired with a response, and *operant conditioning* is one in which a response is encouraged through consequences (Skinner, 1957). While many of the language programs of the time focused on the use of highly complex verbal language training for subjects with autism, Skinner built his language program on behavioral theory. He introduced the use of simple verbal operators such as *tacts* or labels, and simple *mands* or requests, which were easier to use and based on a system of reinforcement and operant conditioning. This type of approach to building language for those on the autism spectrum is still considered an integral part of today's verbal learning programs. Simple *tacts* and *mands* are the basis for visual supports that are included in best practice techniques used in today's classrooms (Skinner, 1957).

The interventions that are most effectively used in classrooms for students on the autism spectrum today are steeped in the field of applied behavior analysis and behaviorism. Skinner's (1957) work stated that the capacity to learn and use appropriate social skills, communication skills and academic skills require the ability to speak, listen and respond. These three behavioral elements were described by Skinner as part of *verbal language* and are an important part of the strategies used in classrooms for students on the spectrum. In addition to the creation of behavioral based strategies, Skinner's work also employed the use of reinforcement system, which is an integral part of an educational program for students with autism.

Visual Supports with Autism

Within the theoretical framework there were three concepts forming the basis for this research. The first of this trio is based on the works of both Kathleen Quill (1997) who wrote extensively on the use of visual supports with subjects with autism. Results from her seminal research studies showed that subjects with autism tend to be visual learners and function well

with routine (Quill, 1997). Quill found that children with autism had a stronger ability to encode visual-spatial information than to encode and process auditory information. This strength seemed to be influenced by the fixed aspect of the pictorial symbol versus the fleeting aspect of the auditory word. Quill also described the struggle a child with autism may have with attending to an auditory sequence of linguistic events and how the memory skills of a child with autism seem to be impacted by the disability. Based on this information, Quill indicated that strengths in visual memory and the ability to use visually cued information lends itself toward the need for a more visually supported instructional design. These aspects of autism described by Quill (1997) are part of the theoretic lens through which the current research study was viewed.

Executive Functioning

Executive functioning (Ozonoff, Pennington & Rogers, 1991) is the second of the conceptual underpinnings on which this research was based. "Executive functions comprise those abilities that enable individuals to maintain an appropriate problem-solving set for attaining future goals. These executive functions include strategic planning, impulse control, organized search, and flexibility of thought and action" (Weyandt & Willis, 1994, p. 1). Being able to organize one's activities; having the ability to plan ahead; possessing the ability to be flexible and predict what is coming; and being able to control one's impulses are all a part of executive functioning. The use of visual supports is one of the interventions designed to assist students in the planning needed for the independent completion of a task; the prediction of what is coming next; and the organization of the activities within the student's day.

Central Coherence

Central coherence (Frith, 1989; Hill & Frith, 2003) will serve as the third of the conceptual underpinnings upon which this research was based. Central coherence can be

described as the ability to combine small pieces of related information in order to understand the concept as a whole. Hill and Frith (2003) maintained that the attention span of students with autism is sometimes trumped by trivial details. This can include the feature details of an object that may be unnoticeable or unimportant to others in the environment. Students with autism may devote a great deal of attention to the small details of not only an object but also to their own interests or tasks, which may render them unable to expand their focus to a more global, usable concept.

Central coherence may also be involved in the understanding of verbal language. Students are sometimes required to listen to and follow the lengthy, complex verbal directives of a classroom teacher. Students with autism, unable to grasp the verbalized directives as one instruction, but, instead, focus on a single step or detail, may not possess the ability to fluidly progress through the steps. The structured design of visual supports serve as a pictorial representation of longer more abstract verbal directives and may help accommodate for the students' difficulty with this concept.

Methodological Structure for Research

This study's methodological structure was a single subject design using a quantitative paradigm with a positivist lens (Punch, 2005). A positivist framework provided the basic structure for the methodological design. I used a positivist framework because it is based on concepts that help structure the data collection process so that the results can be considered valid and reliable. Finlay (2003) described the three basic concepts of a positivist framework as reliability, validity, and the ability to generalize advice. These concepts helped provide a basic structure and framework for the implementation and evaluation of this research (Finlay, 2003).

There were several assumptions of quantitative research that made Positivism the most logical choice for this study. Punch (2005) indicated the assumptions to be that social facts have an objective reality; variables can be identified and their relationships measured; and the primary focus being that of method. This study was based on the overall beliefs of a positivist paradigm state that reality is single and tangible; there are real causal linkages to change; and that basic research inquiry is value-free (Lincoln & Guba, 1985).

Researcher Bias and Limitations

I delved into the research study with two known biases. The first bias was a preference for the use of a significant level of environmental structure and visual supports for students with autism. I was also biased in the belief that the creation of a classroom environment promoting independence in students with autism was extremely important. Even though I recognized that I was biased believing the use of visual supports are necessary to enhance understanding of the classroom work environment, I had no bias in the efficiency of the two types of visual supports used in this study. In order to combat any bias I may have had, I remained neutral in the analysis of the information and relied on the objective data as the decision maker as to the efficiency of interventions.

Limitations to this research study were based on issues inherent to students with autism. The characteristic nature of the disability made it difficult to provide research conclusions that could be generalized across the autism population as a whole. Autism is a spectrum disorder with a wide variety of levels and abilities in several different areas. Some students are significantly impaired in their ability to communicate receptively and expressively. Some students have significant underlying sensory issues that inhibit their ability to access learning, and others possess significant intellectual disabilities which compound their ability to learn. Even though

the sample had a common feature, a diagnosis of autism, global conclusions were not recommended.

Definitions of Terms

The following are definitions of terms used in the chapters of the study:

1. Asperger's Syndrome: a developmental disability that presents with one or more of the following: social awkwardness that affects the ability to build relationships with same age peers; difficulty in using and reading nonverbal behaviors; demonstrated restricted interests and stereotypical behaviors that affect typical functioning; and inability to exhibit emotional and communicative reciprocity (DSM-IV).
2. Autism Spectrum Disorders (ASD): a developmental disability that typically appears during the first three years of life and is the result of a neurological disorder that affects the normal functioning of the brain, impacting development in the areas of social interaction and communication skills (Autism Society of America).
3. Adapted Alternating Treatment Design (AATD): a variation on an *Alternating Treatment Design* whose method "compares two instructional strategies and their relative effectiveness and efficiency on the acquisition of two similar but independent behaviors of equal difficulty" (Gast, 2005, p. 1526).
4. Alternating Treatment Design (ATD): a single subject research design whose method provides a way of comparing two or more interventions on the same behavior (Cooper, Heward, Heron, 2007).
5. Baseline Condition: the initial condition or phase in a research design built to gather information about a subject's ability to perform a task prior to the implementation of an intervention.

6. Behavior Set/Chain: a task that has been analyzed to determine the discrete series of steps involved in the completion of the task.
7. Best Alone Condition: the fourth condition used in the AATD research. During this condition the most effective intervention will be used with the control task in order to collect data on generalization.
8. Control Task: a task without the use of intervention that will be randomly probed throughout the study in order to detect issues with maturation and history.
9. Event Recording: the collection of data on a discrete behavior, one that has a defined beginning and end.
10. Generalization: the ability to transfer the use of a mastered skill from a known task to a novel task.
11. History: one of the threats to validity in a single subject design that includes events that may occur over the course of study that may have an effect on the data.
12. Independent Functioning: the ability to complete a task using only the initial verbal directive.
13. Individual Educational Program (IEP): an educational plan written by a committee for a student with special needs. This plan includes accommodations and modifications to the curriculum based on student need. The document also includes a written plan for teaching skills the student needs to master relative to his or her own strength/weakness profile.
14. Intervention Condition: the second condition or phase in a research design. During this phase, interventions are introduced and used with the subject.
15. Joint Attention: the sharing of attention with others through pointing, showing and coordinating looks between objects and people.

16. Least Restrictive Environment: an environment within a school that is more typical of one that is based on the student's age.
17. Maintenance: a condition or phase in a research design that explores the ability of the subject to continue or retain the mastery of the skill.
18. Mand: to make a request.
19. Maturation: a threat to validity of a single subject design which encompasses a change that could affect the behavior or performance of subjects during the study due to the passage of time or aging.
20. Mayer-Johnson Boardmaker® Program: a computer program that helps one create visual supports by providing a bank of simple visual symbols of words.
21. Percentage of Non-Overlapping Data Points: a percentage of intervention data points that do not overlap. A technique used in the visual analysis of data to note the degree of non-overlap between data points (Gast, 2010, p.441).
22. Picture Exchange Communication System (PECS): the systematic exchange of picture symbols as a means of communication (Bondy & Frost, 2001).
23. Probe Condition: a condition or phase to a quantitative research design that includes intermittent trials to test for maintenance of skill.
24. Prompt: a picture, word or gesture that is given to cue or encourage a response.

a. Verbal Prompt: the use of a word or words to cue a response.
b. Gestural Prompt: a point, wave or motion used to cue a response.
c. Partial Physical Prompt: a touch, tap or light physical assistance to cue a response or compliance to a directive.

d. Full Physical Prompt: the use of full physical or hand-over-hand assistance to cue a response from a subject.

25. Self-Stimulatory Behavior: some type of physically repetitive behavior people with autism typically used to increase or decrease sensory input (example: flapping hands, jumping, squealing, spinning, etc.).
26. Sensory Issues: the over or under sensitivity to sensory stimuli.
27. Single Subject Design: an experimental design with a single or small N (Horner, Carr, Halle, McGee, Odom, & Worely, 2005).
28. TEACCH: a service and training program developed by Dr. Eric Schopler and Dr. Robert Reichler at the University of North Carolina. The *Treatment and Education of Autistic and Related Communication Handicapped Children* (TEACCH) uses a structured format based in behavioral therapy using structured, visually based strategies to teach persons with autism (Schopler, Mesibov, & Hearsey, 1995).
29. Structured Work Systems: a method of teaching skills to students with developmental disabilities that typically involves placing a task in a workbox. The task is structured, with discrete steps and utilizes visual cues to enhance the understanding of the instructions.
30. Visual Activity Schedule: an activity segregated into small sequential discrete steps using a pictorial representation of that step to form a visual schedule of events.
31. Visual Support: a concrete cueing system that uses pictures, words, photographs, or objects in order to assist students in the completion of tasks.

Overview of Chapters

The basis for this research study is rooted in the need to compare the effectiveness of two types of photographic visual supports on the independent performance of multi-step tasks by subjects with autism. Chapter 1 provides an introduction in order to prepare the reader for the topic of the research. Chapter 2 contains a review of the literature on topics pertinent to the study, which include the current interventions and strategies used for students with autism. Chapter 3 discusses the methodology upon which the research study is based. Chapter 4 provides the reader with the results and data from the study while Chapter 5 discusses the overall findings in narrative format. The appendices include all forms related to the study (i.e., data collection forms, social validity survey, procedural fidelity checklists, etc.).

CHAPTER 2

REVIEW OF THE LITERATURE

Chapter 1 provided an introduction to the research study. The purpose of Chapter 2 is to review the literature which serves as the foundation for the study. Chapter 2 is presented in three sections and will review the history of autism education and interventions, the basic need for visual supports for students with autism and the relationship of the literature to the current study.

Historical Review

The early history of autism theory and intervention began in the psychiatric arena. Those with autism were viewed as persons having a psychiatric illness which required interventions developed from a medical model. Although unanswered questions remain, our understanding of the disorder has increased exponentially since the 1950's and moves us into a more educational arena.

Society's understanding of children with autism spectrum disorders is considerably different than when Leo Kanner first documented the disorder in 1943 (Bryson, Rogers, Fombonne, 2003). Kanner initially described a group of children who were detached from social contact with those around them as having *early infantile autism.* He coined this term after Eugen Blueler's (Kanner, 1943) introduction of the term *autism,* describing those who withdraw from the outside world as *autistics*. As time progressed and the research on these children continued, autism began to be seen as a separate diagnostic option. Kanner stated in a lecture in 1965, "Thus arose a tendency to set up a pseudodiagnostic waste basket into which an assortment of

heterogeneous conditions was thrown indiscriminately. Infantile autism was stuffed into this basket along with everything else". Even though this disorder began to be described as a separate entity, the earliest editions of the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 1952), which includes both DSM-I and DSM-II (APA, 1968), "psychotic reactions in children, manifesting primarily autism," were placed under the classification of "schizophrenic reaction or schizophrenia, childhood type" (p. 28). The DSM provided and still provides the reference and structure for all diagnoses made within psychiatric and psychological fields of study.

Because the children had significant problem behaviors and the educational options in the 1960s were limited, the children were "kept at home because of the severity of the retarded, regressed and disturbed behavior" (Bender, Goldschmidt & Sankar, 1962, p. 173). There were no programs within the educational setting to accommodate or educate these students.

As described in Chapter 1, B.F. Skinner's (1957) theory of classical and operant conditioning along with his work on the effects that reinforcement and consequences have on behavior led to his authorship of a book on the application of these techniques. Skinner's behaviorist theories and use of applied behavior analysis techniques employed the use of *tacts* (labels for items) and *mands* (requests for items or activities) for students with language and learning needs. Skinner's (1957) ideas were not widely accepted at the time due to the then popular use of intensive verbal language training programs that encompassed complex language techniques. However, Skinner's work created the behavioral foundation for the visually supported interventions used in current educational settings with students on the spectrum.

Although educational opportunities were increasing, the environments most used for children with autism in the early 1960s continued to be placement in psychiatric hospital settings. This was due to lack of understanding of how to intervene with the complexity of the

student's behavior. In an early article, Bender, Goldshmidt and Sankar (1962) wrote that "autistic schizophrenic" children present challenging and baffling problems in treatment. According to Bender, et al. (1962) autism was seen as a "withdrawal or denial defense against disturbing sensations from disturbed autonomic function, perceptual function, and anxiety" (p. 464-465). The interventions or treatments used during that time to intervene with this withdrawal included electric stimulation of the brain and psycho-pharmaceutical agents. These pharmacological treatments included the use of Lysergic Acid Diethylamide or LSD (Bender, et al., 1962, 1966). Because LSD was a powerful hallucinogen or mood altering drug, the treatments were only used to modify the secondary behavioral symptoms associated with the disorder.

Researchers (Bender, et al., 1962, 1966) and medical doctors initially felt as though the pharmaceutical interventions would be effective in breaking through the defense mechanisms caused by autism and would release the student to an increased level of arousal so the areas of social interaction and communication could be addressed. Even though there appeared to be qualitative gains in social responsiveness and declines in the rates of inappropriate behaviors such as feces smearing and aggression, no subjects made significant gains in the appropriate use of verbal language (Bender, et al., 1962).

In the mid to late 1960s there began to be a shift in thought from a psychiatric medical model of understanding and treating students with autism to a more educational approach using the early behavioral research of Skinner (1953). During the 1960s and 1970s, Ivar Lovaas, a psychologist from the University of California (UCLA), became disillusioned with the then current practices in the field of autism education which led children to be placed in residential treatment facilities. He began applying a behaviorist lens to his work and research with children on the autism spectrum. In 1981, Lovaas collaborated with other professionals and published

Teaching Developmentally Disabled Children: The Me Book, a seminal work that serves as the primary training manual for intensive behavioral therapy for developmentally delayed students with autism (Lovaas, Ackerman, Alexander, Firestone, Perkins, & Young 1981). His landmark research (1987) demonstrated that with early intervention using carefully crafted behavior strategies, children with autism could make impressive gains in their ability to independently function in a school setting and would not necessarily require the residential psychiatric placement used earlier.

In 1974, Koegel and Rincover, early special education researchers, continued to describe autism as "a severe form of childhood psychosis" (1974, p. 1). Even though the diagnosis was judged to be severe, they began to examine different methods of treatment designed to increase the students' ability to function in the classroom and in society. Koegel and Rincover began to research the effects of different types of interventions on the enhancement of communication of students with autism. They also examined the effects those strategies could have on minimizing the inappropriate behaviors that are sometimes characteristic of the disorder. The researchers described one method that paired the organizing and structuring of the physical environment of the classroom with the use of visual supports in order to create a setting the children could understand. This early educational research continued building on the theory that students with autism could learn, make progress, and become functioning members of society if appropriate strategies were employed.

In the 1980s and 1990s the theoretical framework spurring treatments for students on the autism spectrum continued to be refined. Researchers took an educational approach and began to include applied behavior analysis interventions such as Skinner's (1957) work with reinforcement and consequences, with a focus on highly developed individualized teaching

methods to target all areas of need. The areas of need were based on more refined diagnostic criteria for autism spectrum disorders. During this time, an assessment tool, the Childhood Autism Rating Scale (CARS) developed by Schopler and Reichler (1971, 1980) helped lead to a more behavioral approach to the diagnosis. Schopler's interest in children with autism led him to continue his research in this area and to the development of the TEACCH (Treatment and Education of Autistic and Communication Related Handicapped Children) method at the University of North Carolina-Chapel Hill (1995). This approach was based on the understanding that autism was more than a psychiatric disorder, and involved the ability to communicate and relate to others.

In the 1990s and years following the turn of the twenty-first century, theoretical concepts common to autism research and pertinent to the current study, began to surface including *executive functioning* (Orzonoff, Pennington & Rogers, 1991) and *central coherence* (Frith, 1989; Hill & Frith, 2003). Understanding these concepts provided new insight into how certain environmental accommodations such as visual structure and organization appeared to increase a student's ability to independently function in society.

Executive functioning is one of the basic theoretical concepts in autism. As defined in Chapter 1, executive functioning involves the ability to problem solve; the ability to plan and organize thoughts and actions; the ability to consider the steps involved in a process and to use futuristic thinking techniques to predict what is coming next and to remain flexible during the process (Weyandt & Willis, 1994).

Hill and Frith (2003) indicated that perseveration may also be included in executive functioning. Perseveration is one of the stereotypical behavior characteristics many students with autism exhibit. This behavior constitutes becoming fixated on an object, movement, thought, or

activity and being unable to move on. The subject with perseverative behavior issues may insist on sameness and an inflexible routine in order for him or her to make sense of the environment. The subject with autism may be rigid in his or her thought patterns, which may manifest itself into a very literal interpretation of the world.

In order to enhance the ability to use executive planning, it is sometimes necessary to begin by organizing the environment. This external structure helps to increase a student's repertoire of executive planning and organizational strategies so he or she can begin internalizing ways of organizing time and space. External structure assists the student by creating a space that forces organization. This organization serves as a model for the student so that he or she can begin to internalize these strategies and routines for future use. This also assists in shifting the control to more independent control, having the student rely more on his or her own abilities and less on prompting from others (Orzonoff, Pennington & Rogers, 1991). The concept of executive functioning is closely related to the need for environmental structure through the use of visual supports.

As defined in Chapter 1, central coherence is another important learning concept related to students with autism. Central coherence is the student's ability to understand a concept as a whole. The ability to take small chunks of information and unite them together to form a total concept is key to learning to function in a classroom setting. Some of the classroom issues involved include the use of complex multi-step verbal directives, the requirement of understanding several discrete steps in a total problem, and understanding the sequence of behavioral steps involved in social situations. Students may become so focused on the discrete step involved in the completion of a task that they may be unable to expand their focus to a more global educational or social concept.

Frith (1989) also described the concept of central coherence as one of the reasons students with autism have stronger abilities in linear areas such as math and engineering than in more abstract areas such as language arts and reading. Hill and Frith (2003) said that the attention span of students with autism can be consumed by small details of objects, interests, and even verbal directives. In order to play upon this strength while guiding students to a more global understanding of what is required of them in the classroom, a visual support or pictorial representation of a requested task can be used. This will allow the student to see the small steps in a more complete way (Hill & Frith, 2003).

In the 1970s, Lovaas (1977) and his colleagues developed what was considered to be a promising new teaching method for students with autism. This method is still considered to be one of the most widely known interventions used with children on the autism spectrum. The *Lovaas Method*, as it would later be coined, described an intensively controlled strategy of teaching discrete steps in a structured format using data to dictate the move to the next step. The method, also known as *Discrete Trial Training* or DTT, required as much as 40 hours a week service from someone trained to use the method. This intensive training would continue for two or more years as an early intervention technique during the child's preschool years. Discrete trial training (DTT) sessions are organized and structured by providing a hierarchical format to the presentation of tasks, analyzing tasks and breaking them into smaller discrete steps, using visual supports as required by the communicative level of the student, by progressing the sessions based on data and methodologically moving from one skill to the next. Discrete trial (DT) sessions continue to be used in both therapeutic settings and in early educational environments as part of a broader based ABA (Applied Behavior Analysis) program.

In the late 1980s and early 1990s research by Dalrymple (1989; 1995) continued to evidence a need for structure in educational environments. Dalrymple's research suggests that students with autism require four types of supports in the classroom. These include sequencing supports for structuring time, visual procedural supports for activities, visual supports for environmental organization, and visual supports to assist with interactions between others. The supports utilized a visual format that appeared to help the students organize the abstractness of their environment and were typically created by using pictorial symbols of events, activities, or tasks.

In the 1990s Carol Gray continued the development of an intervention for students with autism that began with the priming technique used by the Koegels (2000) in the 1970s. *Social Stories* (Gray & Garand, 1993) were created as a visual technique for teaching children with autism how to read the intricacies of the social environment. This technique used a four to six word sentence to describe a social interaction (Thiemann & Goldstein, 2001), often including pictorial representations of the ideas presented in narrative form. This technique was intended to visually demonstrate social situations and provide support to subjects who struggle comprehending the quick exchange of information which typically occurs in a verbal conversation. The technique turns an abstract situation into a concrete representation that allows time for reflection. The technique of using visual supports to add structure to an abstract event is important in the design of classroom task interventions.

In the 1990s, Eric Schopler continued to focus on environmental structuring in the development of the Treatment and Education of Autistic and Related Communication Handicapped Children or TEACCH method. The TEACCH method makes use of tasks placed in shoebox-type workboxes to create structured activities that would clarify the 'where-how-when-

how long' of the tasks. The method employed the use of structure, task analysis, and visual organization to create an environment where the children could independently maneuver in the educational setting (Panerai, Ferrante, & Zingale, 2002).

In 2000, Dettmer, Smith, Myles and Gantz continued to investigate the impact structured work systems with visual supports had on the ability of children with autism. Structured work systems were described as work tasks that were task analyzed into discrete steps and could be taught in a sequential order using the organization of materials and the application of visual supports. The work by Dettmer, Smith Myles and Gantz revealed a positive relationship between the use of a structured work system using visual supports and the reduction of the latency level between verbal instruction and compliance. The research conclusions indicated that the use of a structured method of organizing work tasks in the classroom shortened the time between the verbal instructions given by the staff members and the compliance behavior exhibited by the student. This was important in that it maximized the time spent on-task in the classroom.

The implementation of this visually supported system also reduced the frequency and level of adult prompting. Dettmer et al. (2000) stated that the implementation of an organized work system enhanced with visual supports appeared to have a positive impact on a student's ability to complete classroom tasks in an educational classroom setting. The use of pictures or graphic symbols for actions or objects continued to be found to be effective and began to be used as an alternative form of communication for students who were non-verbal or lacked the verbal communication skills needed to function. The exchange of these visual symbols was considered to be equivalent to using verbal communication (Son, Sigafoos, O'Reilly & Lancioni, 2006) but seen as an alternate form.

As discussed in Chapter 1, a project began in 2005 by a group of experts in the field of autism to compile a list of strategies used by those working with those on the autism spectrum. This project came to fruition in 2009, as the National Autism Center produced a document called the National Standards Report. This report provides readers a guide to the most current evidence based interventions to help with decision making about use and effectiveness. The National Standards Report (2009) divided the treatment methods used for children with autism into those that are *established, emerging*, and *unestablished*. Among those considered to be established and empirically based are the use of visual supports and modeling.

Basic Need for Visual Supports

In her seminal piece of literature written in the early 1990s, Kathleen Quill (1995) cited evidence that supported the use of communicative visual stimuli, stating that this type of intervention appeared to create a way of enhancing the ability to process communication. Quill indicated that children with autism are more able to process a two or three-dimensional visual stimulus than an auditory stimulus and that verbal communication is a transient, more fleeting type of stimulus that lacks the static concreteness of a visual picture. This knowledge moved the field into the use of visually supported interventions.

Using Visual Supports to Improve Classroom Learning

The environment or ecology of a classroom is an important component for learning. In 2008, Mitchell states that the environment of a classroom is vitally important in facilitating an atmosphere conducive to student achievement. Kayikci (2009) also stated that a well prepared physical environment, complete with order and organization, seems to create an easier atmosphere for teaching and learning. Kayikci indicated that an ill prepared, poorly organized and poorly managed classroom setting can negatively affect student participation and learning.

Schopler and Mesibov (1994) suggested that using environmental structure along with visual supports will help to minimize the cognitive learning and basic achievement deficits characteristic of autism. A visually structured environment capitalizes on strengths in visual processing, desire for sameness, and special interests (Schopler & Mesibov, 1994).

In 2002, Boswell and Nugent cited Quill's research (1995) stating students with autism seem to perform best on academic and teaching tasks using visual elements that continually remain in view. Boswell and Nugent also stated that Quill's research supported the belief that students were better able to "focus their attention on visual materials than to attend to the rapidly changing social and communicative events inherent to instruction" (Quill, 1997, p. 707). Boswell and Nugent (2002) reported that because of the predictable order, students with autism seem to have a particular interest in numbers, letters, and the sequential order of things in their environment. Using the need for predictability, order, and static visual stimuli seemed to be important aspects in moving the field toward the development of different types of visually supported interventions.

Quill (1995, as cited in Dooley, Wilczenski, & Torem, 2001) emphasized the importance of using visual supports to structure the environment in order to "enhance the understanding of verbal and environmental cues by children with autism" (p. 57). Dalrymple's (1995) research indicated that in order for students with autism to be successful they may require several different types of supports, combining the structure of tasks in general, and several types of visual supports.

Using Visual Supports to Teach Social Skills

A deficit of social skills is one of the key deficits in an autism spectrum disorder. The ability to use appropriate social skills involves the ability to comprehend verbal directives,

understanding the social environment, generalizing previously learned skills and correctly determining which of the learned skills to use in which situation (Bryan & Gast, 2000; Ganz et al., 2008). Prie's (2006) research stated that the use of visual supports serves as a trigger to recall or maintain previously learned skills. This appeared to be key to maneuvering the social environment. The use of these visually supported interventions have been seen as effective in helping subjects attend to relevant information in their environment, attain and maintain joint attention (Yoder & Stone, 2006), generalize and maintain learning skills (Pries, 2006), organize tasks (Mesibov, Shea, & Schopler, 2005), and predict and make sense of their environment (Heflin & Simpson, 1998).

Thiemann and Goldstein's study (2001) continued to support the use of visual strategies in teaching social skills to students on the autism spectrum. The researchers summarized the results of the study and stated that "capitalizing on the visual modality resulted in higher rates of socially desirable communication skills, lower rates of inappropriate communication behaviors, and improved conversational skills" (Thiemann & Goldstein, 2001, p. 444).

Using Visual Supports to Teach Language and Communication

"Language and communication are major areas of concern for children with autism" (Marckel, Neef, & Ferreri, 2006, p. 109) and in order for a student to adequately function in the classroom he or she must have some mode of communication. This communication may be verbal and involve the spoken and written word or nonverbal and encompass the use of eye contact, personal space, and body language. The National Research Council (2001) estimated that one-third to one-half of those students with autism do not possess functional speech and language skills.

In 2000, Kogel stated that with the use of visual supports, practitioners appeared to be making progress in remediating many of the characteristic communication weaknesses in students with autism. Ogletree, Oren & Fisher (2007) described the most effective communication-related practices for individuals with ASD as a group of evidence-based intervention techniques that include prompting, modeling, visual structure and visual supports. In 2003, Aspen and Austin (2003) reported that the "addition of visuals to support language may even promote growth in the areas of both receptive and expressive language" (p. 11). The authors continued, stating that pictures are one type of visual support that will enhance a subject's communication ability. In 2006, Pries suggested the use of visual supports in the form of picture symbols was found to be effective for the generalization and maintenance of verbal commands and basic communication for students with autism.

Bondy, Tincani and Frost (2004) suggested that traditional speech programs used with students who had language disorders may be problematic. The programs such as complex verbal training and the use of sign language, required the ability to attend to task, attend to person, and demonstrate the ability to imitate complex motor movements. Bondy, Tincani and Frost (2004) indicated that many students with autism did not possess these abilities and, in order to intervene for these weaknesses, the researchers developed an alternate form of communication known as the Picture Exchange Communication System (PECS). This system involved the systematic exchange of picture symbols as a means of communication. The system had advantages over other interventions in that it used no complex motor movements such as sign language, was low cost and portable, and used the visual strengths of subjects with autism (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002).

Using Visual Supports to Teach Independent Task Completion

Learning and mastery encompass the ability to work toward the completion of a task independent of direct assistance from another person. Independent functioning can be defined as "on-task engagement on an activity in the absence of adult prompting" (Hume & Odom, 2007, p. 1166). Many researchers agree that promoting independent functioning, task completion, and decreased dependence upon adults is vitally important to the education and basic skill mastery of subjects with autism (Bryan & Gast, 2000; Hume, Loftin, & Lantz, 2009; Hall, McClannahan & Krantz, 1995; Mechling & Gast, 1997; as cited in Bryan & Gast, 2000, p. 553) and is vitally important in today's classrooms.

Hume, Loftin and Lantz (2009) stated that the ability to develop an adequate level of independent task completion skills may be difficult for students with autism spectrum disorders due to the core deficits of the disability. Research by Dawson and Osterling (1997) and Dettmer, Simpson, Myles, & Ganz (2000) suggested that, in order to enhance the ability of students on the spectrum to independently complete tasks in the classroom, students may require a structured teaching environment that relies heavily on the use of visual supports. McClanahan and Krantz (1999) specifically highlighted the value in using pictorial visual schedules as a way of teaching independent task completion skills to children with autism.

Types of Visual Supports

Line Drawings

During the initial implementation of visual supports, the first type of intervention that was used was black-line drawing. In the 1980s, Wacker and Berg (1983) used a series of black-lined drawings as visual supports to teach classroom tasks consisting of up to 30 steps to students

with cognitive disabilities. This type of visual support was simple to create, did not require the use of complicated technology and was simple to implement in the classroom by educators.

McClannahan and Krantz (1999) also began using visual supports in the form of activity schedules. They defined a visual activity schedule as "a set of pictures or words that cues someone to engage in a sequence of activities" (p.3). The researchers continued to state that these visually supported activity schedules could be created using a variety of methods, which included the use of black-lined pictures to represent each step of a detailed task analyzed activity. This line drawing representation of steps to a task could then be placed into a three-ring notebook binder and used by the student as a cueing system for the completion of the sequential steps required for a task. This type of visual support could also be used by mounting the drawing on a student's desk with Velcro or mounting it on a strip of cardboard which allowed for portability. Regardless of the way the schedules are created, McClannhan and Krantz (1999) suggested this pictorial representation of a task be used to "enable children with autism to perform tasks and activities without direct prompting and guidance." (p. 3). Using this support appears to assist the student in the discernment what the task is, what it requires, and the sequence of steps necessary to accomplish it. It also helps to promote independence by moving the locus of control from another person in the environment to an intervention used by the student.

Static Photos

The use of static photographs as a way of creating a more complex visual support began being used as access to photographic technology, such as digital cameras, became prolific in special education classrooms. Researcher began examining the use of this medium and the efficacy of its use for students with autism. MacDuff, Krantz, and McClannahan (1993) were

some of the first researchers to examine the use of static photographic visual activity schedules to teach on-task behaviors. The participants in this study were subjects with autism and the results indicated an increase in on-task behaviors and a decrease in the need for supervision and prompting from adults.

Pierce and Schriebman (1994) examined the use of pictorial activity schedules through a single-subject multiple baseline research design. The researchers studied the efficacy of using a visual schedule to teach three students with autism to manage their own behavior without oversight from an adult. The data indicated that the students were able to self-manage using pictorial symbols and also showed a decrease in stereotypical behavior. Schmit, Alper, Raschke, and Ryndak (2000) also used a single subject multiple baseline design to examine the effects of a static photographic visual cueing system on the reduction of tantrums in a child with autism. The results reflected a significant decrease in the frequency of tantrums. Johnson and Cuvo (1981) used static photographic recipes to teach cooking tasks; Wacker, Berg, Berrie and Swatta (1985) used visual schedules to teach multi-step clerical tasks; and Thinesen and Bryan (1981) taught self-care and hygiene skills all using visual supported activity schedules.

O'Reilly, Sigafoos, Lancioni, Edrisinha and Andrews (2005) examined the effects of a visual schedule on self-injury and engagement in a child with autism. The design explored the effectiveness of using a visual schedule to decrease the frequency of self-injurious events and increase the level of engagement. Results indicated a marked decrease in self-injury that sustained itself for up to five months following the study. Bryan and Gast (2000) used a single subject withdrawal design to examine the effectiveness of visual activity schedules with high functioning students with autism. The skill examined on-task behavior and the results indicated

that the behavior rose to set criterion levels and maintained as long as the visual support was in place, but when it was removed, the students were unable to continue at maintenance.

Static Photographic Modeling and Video Modeling

The use of student modeling or the imitation of a desired behavior by acting it out or staging it, has become a widely used method of intervening with social skills and independent functioning skills for students with autism. The use of modeling is included in the *National Autism Standards* (2009), as one of the established interventions and many researchers have made this a topic of study.

Beginning with the use of static photographic supports that depicted models of a target behavior, researchers typically employed the use of computer technology (Downing & Peckman-Hardin, 2000; Hodgdon, 1995; McClannahan & Krantz, 1999; Quill, 2000; Savner & Myles, 2000). Computerized visual supports utilized software such as *Microsoft® Powerpoint®* to integrate static photographs and audio and video clips into activity schedules. The photographs and videos were of the subjects engaged in the appropriate step or activity. This proved to not only gain the interest of the students but to also enhance their understanding of their environment (Buggey, 1999, 2005; Neumann, 2004, Stromer et al., 2006).

A comparative study between the use of video-modeling and in-vivo, or live modeling, was conducted by Charlop-Christy, Le, and Freeman (2000). Results from the study showed that video-modeling was not only effective in moving toward criterion at a faster rate but also generalized to other tasks. Nikopoulos and Keenan (2003) used a multi-treatment research design to examine the effects of video-modeling on the ability of students to initiate specific social skills. Due to behavioral issues with some of the participating subjects, the results proved unsuccessful. The results suggested that success using video-modeling has prerequisite behaviors

that must be present prior to implementation (i.e.; the ability to attend to task and watch a video without disruption).

A study that compared the use of static photographic visual supports of steps to a task being modeled and video of steps to a task being modeled was completed by Cihak, Alberto, Taber-Doughty, and Gama (2006). An AATD was used to compare the effects of the two treatments to two behavior chains. Both strategies yielded positive results but results reflected little difference between the two strategies in the move toward criterion. In 2010, Hammond, Whatley, Ayres, and Gast used a single subject multiple treatment design to study the use of video-modeling with intellectually disabled students. The design examined the strategy in promoting the skill to use an *iPod Touch*®. The study yielded positive results as to the effectiveness of video-modeling with the acquisition of skill in using an iPod. The skills deteriorated during follow-up probes but were quickly attained again with review of the video strategy.

In 2010, Cihak, Wright and Ayres completed a study evaluating the effects of static self-modeling photographs on academic engagement of students with autism. The results indicated that the students were able to use a handheld computer that depicted photographs of the subjects engaging in several tasks within the classroom. The visuals were used to assist the subjects in self-monitoring in order to increase their engagement in several different school settings. The results were positive and indicated that all students benefitted.

Of the literature I reviewed, all studies found significant progress in meeting each of the outlined criteria and made progress toward set criteria with the use of visual supports. The use of visually supported interventions has also been included as one of the effective strategies in the National Autism Report (2009). In reviewing the literature there appeared to be no studies found

that compared photos of materials used to complete the step of a task to the student modeling the completion of a step to a task. There were also no studies using static photographic supports depicting subjects modeling the desired behavior and no comparative studies between two types of photographic visual supports. This gap in the research guided my design on this study.

Relationship of Literature Review to the Current Study

Autism is a complex disorder. Since it was first recognized in the 1940s, treatment for the disorder has been well researched. The literature reviewed above supports that visual supports is one of the most widely accepted, research-based forms of interventions. Even though the literature is robust with studies proving the effectiveness of visual supports, there is a gap in the research. The gap is in the lack of comparative studies using two types of static photographic visual supports: one photo using a subject modeling the required behavior for a step to a task and the other photo depicting the materials used in the completed step of the task. My research study is designed to fill this gap.

CHAPTER 3

METHODOLOGY

Chapter 1 served to introduce the study providing the research questions and theoretical concepts upon which the study is based. Chapter 2 reviewed the literature pertinent to the study and provided the study's research foundation. Chapter 3 will provide the methodological structure and procedures that will be followed for the study.

The research question was: *What are the comparative effects of using a photographic visual support that depicts only the materials in the completed step and a photographic visual support that depicts the student using the materials to complete each step on the acquisition of independent performance of multi-step tasks by students with autism?* The independent variable was defined as the use of photographic visual supports and the dependent variable was defined as the subject's performance in learning to complete the steps to the tasks. My hypothesis (H) was *the use of a photographic visual support that includes the subject demonstrating or modeling steps of the task will reach criteria before the use of a photographic visual support that includes a photo of only the materials used in the completion of each step to the task.* The null hypothesis (H_o) is *that there will be no difference in the efficiency of the two interventions and both will reach criteria at the same time.*

Research Design

In planning my research design, I used a method described in a lecture by Wallace (2007) known as the *APIE Method* as the means of assessing and structuring this research study. The term *APIE* is the acronym for the four basic steps involved in this method:

- Assess the issue
- Plan the study
- Implement the treatment protocol
- Evaluate progress

I assessed the topic through a review of the literature in Chapters 1 and 2; planned the methodology of the research study in Chapter 3; implemented the treatment protocol and will report and evaluate the progress in Chapters 4 and 5.

A single subject adapted alternating treatment design (AATD) was used in this comparative study. The purpose of this study was to compare the efficiency of two types of static photographic visual supports with subjects diagnosed with autism. Efficiency was defined as the first intervention to reach criteria which is 100% mastery on subject performance trials over three consecutive sessions. Criteria were determined by comparing the student performance data and examining the differences in

- sessions to criteria
- percentage of non-overlapping data points
- presence of maintenance and
- presence of generalization.

In determining the most appropriate research design, I will review both *Group* and *Single Subject* designs and will provide information supporting the selection of the specific design selected for this study.

Group Design

A *group design* is defined as a research study in which "a large number of individuals are divided and assigned to one of two or more study phases" (Gast, 2010, p. 7). In these designs the individuals in the groups are typically divided into two, one receiving the treatment or intervention and one serving as the control and not receiving intervention. In a group design, one of the two groups will serve as the control, not receiving the intervention. The groups are created by randomly assigning the subjects to one of two groups. The groups will be equivalent as the sample from which they are selected must be somewhat equivalent on key characteristics (Rosenberg, Bott, Majsterek, Chiang, Gartland, Wesson, et al., 1992). The pool of prospective subjects must be homogenous so that when the two sample groups are randomly chosen, the groups will be homogenous. The difficulty with choosing a group design for research with subjects on the autism spectrum is that the nature of autism is as a spectrum disorder with a wide variety of characteristics. The pool of potential subjects with autism is not a homogenous pool from which two randomly selected homogenous groups can be derived.

Research studies that employ the use of group design typically analyze the data through the use of inferential statistical analysis methods. After the completion of the analysis process, the results from the study can then be generalized to a larger population due to the homogenous nature of the pool from which the samples were chosen. This type of statistical analysis and generalization of results is not appropriate for this study as the population of subjects with autism is not a homogenous group.

Single Subject Design

Single subject design is defined as an experimental design with a single or small sample size (Horner, Carr, Halle, McGee, Odom, & Worely, 2005). Single subject methodologies use a comparative approach to research and examine the behavioral change of a subject or small group of subjects over time. This approach compares behavioral responses in two separate phases, baseline phase and intervention phase. Single subject research designs were initially used in the early 1900s by Ivan Pavlov and began to be more widely used in the mid twentieth century by Skinner in 1953 (Sidman, 1960; Hersen & Barlow, 1976; Kazdin, 1983).

Horner et al. (2005) describe single-subject research as "a rigorous scientific methodology used to define basic principles of behavior and establish evidence based practices" (pp. 165). "Single-subject research is experimental rather than correlational or descriptive, and its purpose is to document casual or functional relationships between independent and dependent variables" (Horner et al., 2005, p. 167). Initially, a target behavioral response is identified and observed in the subject or subjects through one or more phases of the design. A single subject design compares the behavioral responses of a subject during a baseline phase to the individual's behavioral responses during an intervention phase. In some studies, the research continues on into a maintenance phase, measuring maintenance and generalization of skills. During the baseline phase, there is no intervention used with the subject and the individual's behavioral response will be compared to subsequent phases where the subject will receive interventions (Smith et al., 2006).

The method of analyzing data in a single subject design is conducted through the use of visual analysis. In this study, where specific questions regarding the comparative efficiency of interventions used with a specific population are the focus, a visual analysis is the method that is

recommended. It is a practical approach when seeking to answer specific research questions and make changes to individual cases based on data. In this type of analysis the data are graphed so that researchers can visually inspect the data to determine trends, determine if criteria have been met, identify differences between intervention data, and determine if there is a difference between intervention and control data.

Single Subject in Special Education

Single subject design is described as an appropriate strategy for use with students in special education due to the rigorous, detailed analysis of individual subject specific data. Subjects with special needs are complex individuals and multifaceted in their ability profile. The complexity of their profile lends itself well to subject specific examination of response to intervention. This examination of the individual subject's response to specific strategies and intervention leads to the implementation of techniques that are individualized for a specific need.

Literature supports single subject design with subjects in special education for the following reasons (Horner, et al., 2005):

- It focuses on the individual student
- It allows for analysis of responders and non-responders
- It is practical in its examination of academic and behavioral interventions
- It is practical in its implementation of research designs in typical educational settings
- It is cost-efficient
- It allows for the testing and examination of educational concepts (Ganz, Kaylor, Bourgeois, & Hadden, 2008; Cihak, Alberto, Taber-Doughty, & Gama, 2006; Hammond, Whatley, Ayres, & Gast, 2010; Charlop-Christy, Le, & Freeman, 2000; Bryan & Gast, 2000).

The participants in this study are subjects diagnosed with an autism spectrum disorder. This was an important factor in the determination of the most appropriate research design.

S*ubjects with Autism Spectrum Disorders.* Single-subject research designs have typically been the methodology of choice when assessing the efficacy of an intervention used for students with autism (Smith, Scahill, Dawson, Guthrie, Lord, Odom, Rogers, & Wagner, 2006; Olgetree, Oren & Fisher, 2007; Nikopoulos & Keenan, 2003; O'Reilly, Sigafoos, Lancioni, Edrisinha, & Andrews, 2005; Pierce & Schriebman, 1994). The spectrum nature of autism lends itself well to single-subject research. Because autism is a spectrum disorder and is uniquely manifested in each affected individual, global comparison among groups of subjects is difficult. Research data yielded from studies of homogenous samples is not possible with students on the autism spectrum because the population is not a homogenous group. For this reason, single-subject designs are the most effective.

Strengths and Weaknesses/Threats to Validity

The strengths and weaknesses of a single subject design are based on threats to internal and external validity.

There are several identifiable strengths to single subject research. One of the strengths is the capability of comparing intervention data of a single subject to the individual's own baseline data. The systematic comparison of a dependent variable or target behavior to its own baseline data assists researchers in examining the efficiency of an intervention. "Single case designs are useful starting points for establishing efficacy because they yield evidence that the technique has a clear, replicable effect on a specific behavior" (Smith et al., 2006, pp. 356).

Another of the strengths to single subject research is that the smaller sample size lends itself to easier manipulation of the treatment or intervention (Zhan & Ottenbacher, 2001).

Depending upon the participant's performance, the intervention may need to be modified and changes made to the intervention schedule, rate of reinforcement and/or method of data collection. This can occur more quickly in single subject designs as compared to group designs.

With the small sample size of a single subject research design, there are fewer resources required for the study. This enables a greater number of research projects to be conducted which will contribute to the overall body of research in the area of focus (Hayes, Barlow & Nelson-Gray, 1999). Because of this, the fidelity of intervention strategies is strengthened with the increased number of investigative research studies.

Single subject experimental methods also have weaknesses inherent in their design. One design weakness is that single subject research does not lend itself to extremely complicated statistical analyses (Zhan & Ottenbacher, 2001; Barlow & Hersen, 1984; Huitema & McKean, 1998). Statistical formulas can be applied to single subject research data but a visual analysis of the graphed trend lines is generally used. "The visual analysis of graphic data, in contrast to statistical analysis of data, represents the most frequently used data-analysis strategy employed with single subject research designs" (Gast, 2010, pp. 199). One weakness noted in this type of analysis is that statistical differences cannot be derived without the use of statistical formulas. The researcher cannot determine if the difference between intervention data is statistically significant without running a statistical analysis.

Within all single-subject designs, there are specific threats to validity (Gast, 2010). These are:

- *Maturation* of the subject over time
- Events that will occur over the *history* of the study
- *Procedural fidelity* or the consistency of the implementation of the design

- *Multi-treatment interference* or the interference of one intervention on another
- *Attrition* or the dropping out of a subject from the study.

Critics of single-subject design have also identified the inability to generalize findings of single-subject research data to a larger population (Hilliard,1993; Smith et al., 2006). The global impact of the results to subjects other than the participants of the single subject study would be difficult to determine. In order to address this drawback of the design the researcher is required to use thorough subject descriptors so the research sample characteristics can be clearly defined and replicated.

Review of Single Subject Designs

Within single subject research, there are typically three basic designs: reversal, multiple baseline, and alternating treatment designs (Zhan & Ottenbacher, 2001).

Reversal design. A *reversal* or ABAB design is one of most widely used of the single subject designs (Gast, 2010). It is one in which the subject's behavioral response or dependent variable is measured without intervention during the baseline phase. After baseline has been established, an intervention or dependent variable is then applied. When a stable trend is established during the intervention phase, the phase is reversed back to baseline procedures. When a trend is established during the repeat of baseline, the intervention is then reintroduced. The reversing of phases sets up a scenario where the researcher can examine the effectiveness of the independent variable to the dependent variable (Tawney & Gast,1984).

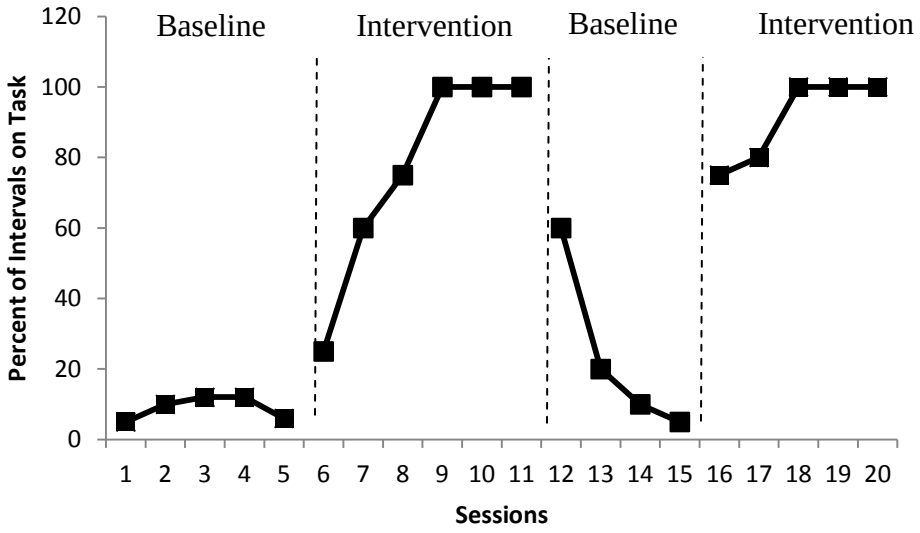
There are both strengths and weaknesses noted in a reversal design. One of the strengths or advantages to this type of design is in its simplicity. A reversal design is one of the most widely used (Gast, 2010) and is easy to implement in a classroom. The simple reversing of the intervention can produce data that shows its effectiveness.

The reversal design also lends itself to criticism. The primary disadvantage or weakness in the design is the reversal of intervention. The implementation of the intervention may be yielding data that shows its success with a subject and the reversal of the intervention places an ethical dilemma on the educator in the classroom. Another weakness is that the choice of behaviors is limited to those that are reversible, and most learning behaviors are not reversible.

An example of data that would be produced from a r*eversal design* is shown in Figure 1:

Figure 1

Example of Data from a Reversal Design



Multiple baseline design. A *multiple baseline design* (MBD) can be described as one that has an extended baseline and a staggered approach to the implementation of an intervention (White, 2010). An MBD has no reversal or withdrawal of intervention/treatment procedures; the design is simple to implement in classrooms, permitting educators to do research; and they are designed to easily implement measures of efficacy (Gast, 2010; Baer, Wolf, & Risley, 1968).

In a multiple baseline design, the baseline is considered as the pre-intervention phase. This phase begins at the same time with all participating subjects, and the behaviors must be independent. As the baseline phase moves to a flat or stable trend for subject one, the

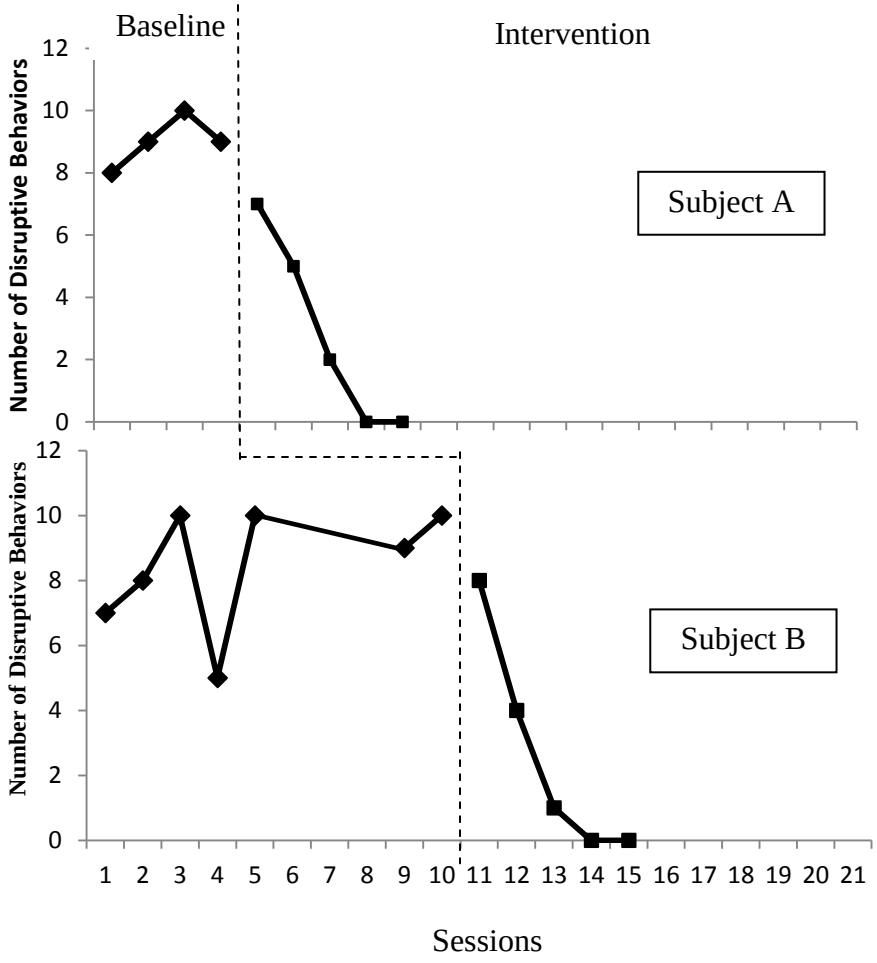
intervention phase is introduced. Baseline phases continue for all other subjects, and the intervention for each is delayed. As the data indicate a move into a stable or progressing trend for subject one, the intervention is then introduced to subject two. This continues until all subjects have entered the intervention phase. The intervention phase then continues until criteria are met or the trend is flat and the researcher is able to determine that the intervention is not working for the subject (White, 2010).

One of the advantages to a multiple baseline design is that it does not require the removal of an intervention. Another advantage or strength to this type of design is that it is simple to implement in a classroom which permits educators to do research (Gast, 2010; Baer, Wolf, Risley, 1968). The primary weakness of a MBD is the delay of using a promising intervention with a subject. If the intervention appears to be making positive changes with subject one, the delay in using the intervention with other subjects can be an ethical dilemma for educators in the classroom. The behaviors under investigation during the study must be both independent but similar in nature.

An example of data that would be derived from a research study using a *multiple baseline design* is shown in Figure 2:

Figure 2

Example of Data from a Multiple Baseline Design



Alternating treatment designs. An *alternating treatment design* (ATD) and an *adapted alternating treatment design* (AATD) are single subject designs that involve the comparison of two more different interventions. They are designs that rapidly alternate the phases to evaluate, examine, and compare the effectiveness of different interventions (White, 2010). Since the goal of this design is to compare interventions that have already demonstrated effectiveness, the design employs the use of well-established interventions.

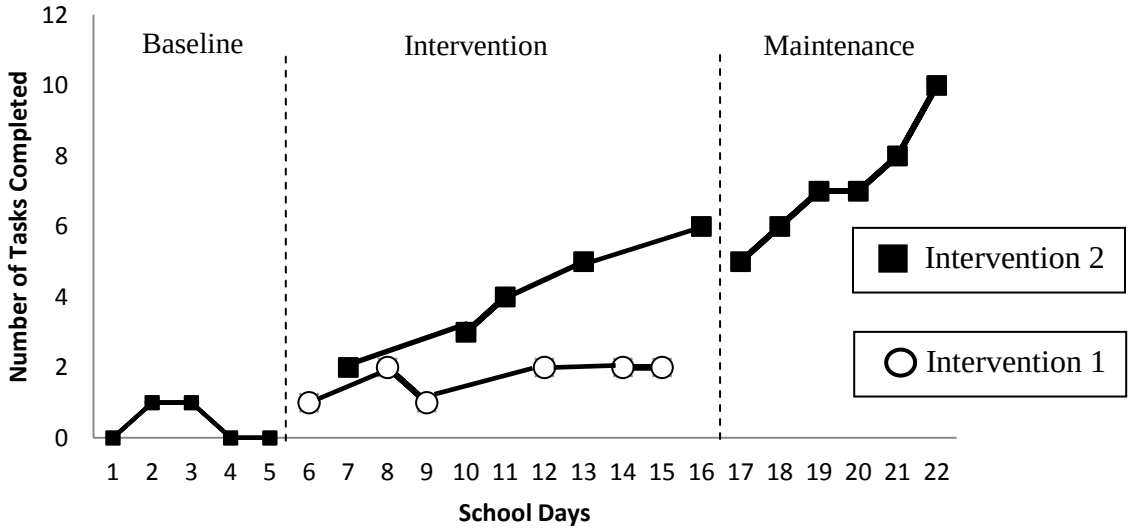
This type of research study is designed so that the interventions are randomly implemented in an alternating fashion after the completion of the baseline phase. The phases of a basic ATD typically include the following three phases:

- *Baseline* phase: no interventions are used
- *Intervention* phase: the two intervention strategies are implemented
- *Maintenance* phase: continuation of interventions that have reached criteria

An example of data from a basic ATD is shown in Figure 3.

Figure 3

Example of Data from an Alternating Treatment Design



The graph in Figure 3 provides a visual depiction of the data for two interventions. The data points for each intervention are shown using different symbols. This graph allows for the visual analysis of comparative data from two interventions using one subject and one task.

An *adapted alternating treatment design* (AATD) is a variation on the *alternating treatment design* (ATD). This experimental design is a comparative, non-reversal design. The

design was initially developed to compare intervention strategies with nonreversible behaviors (Sindelar, Rosenberg & Wilson, 1985). The primary function of an AATD is to "compare two instructional strategies and their relative effectiveness and efficiency on the acquisition of two similar but independent behaviors of equal difficulty" (Gast, 2005, p. 1526).

There are typically three to four phases in an AATD design: baseline phase, intervention phase, probe phase and best alone phase. Each phase is described below:

- *Baseline phase*: This phase lasts three to five sessions or until data are considered stable, which is typically defined as three data points that are flat or descending. This is the initial probe of behaviors without the implementation of interventions. All tasks are probed during this phase.
- *Intervention phase*: Two different interventions are introduced to two different behaviors sets/chains. The combination of intervention to behavior set/tasks is randomly selected and remains constant throughout the study. This phase typically lasts until one of the interventions meets criteria. The control task continues to be probed during this phase.
- *Probe phase*: During this phase, maintenance data on the most effective intervention are collected. Continued instruction will occur using the less effective intervention and the control task will continue to be randomly probed.
- *Best Alone phase*: The addition of this fourth phase further strengthens the design's conclusions. While some consider this phase optional, my methodologist recommended the inclusion of this phase in the current study. This was to further structure the collection of maintenance data on all tasks; to provide an opportunity to assess generalization on the interventions; and to provide an opportunity to determine an accurate measure of how many additional sessions were required for the less effective intervention to reach

criteria. During this phase, the more effective intervention is typically probed in order to gather maintenance data. The best alone phase is designed so that the less effective intervention can continue to be taught if it has not yet met criteria. When the less effective intervention meets criteria, it will be probed for maintenance. During this phase, the most efficient intervention is to be paired with the control task in order to gather data on generalization.

The AATD is characterized by the application of two or more different intervention strategies or independent variables to two or more different tasks. This differs from an ATD which applies different intervention strategies to the same task. The interventions and tasks used in an AATD are randomly assigned and the assignment remains constant throughout the study. Some researchers include a control task in addition to the different tasks used with the different interventions. The control task is also randomly assigned. Student performance data are taken on the control task during baseline and are probed during the intervention and probe phases. This helps control for maturation and history. During the best alone phase, the control task is taught using the more efficient intervention. This provides for an intra-subject replication of the more efficient intervention and an assessment of whether the more efficient intervention generalizes to another task.

There are several advantages and strengths associated with an AATD. One of the strengths in the design is that an AATD allows a researcher to "compare instructional strategies with nonreversible behaviors, including evaluations of effectiveness and efficiency" (Gast, 2010, p. 362). An *adapted alternating treatment design* allows two or more active interventions to be compared and does not require the researcher to withdraw or withhold an intervention as would a *reversal design*. This is especially important when the sample includes students with special

needs. It could become an ethical dilemma if the study was designed to withdraw an intervention that was showing a positive effect on the subject's behavior.

Another of the strengths of an AATD is the phases are typically short in duration so the comparison can be made more quickly. Yet another of the strengths of the design is that, unlike an ATD which compares interventions across the same behaviors, the AATD compares the effects of interventions across differing behaviors. The comparison of multiple interventions can sometimes lead to multi-treatment interference. One of the ways to lessen this effect and minimize the potential problem is to randomly assign or vary the interventions across time and task. This variation in time and task will help to make the AATD more powerful.

In an *adapted alternating treatment design,* as with all research designs, there are threats to both internal and external validity. One of the biggest threats to internal validity is when the behaviors being examined are not independent and are either too similar or too different in nature. Additionally, threats to an AATD's (Gast, 2010) internal validity also include issues with maturation, history, procedural integrity, instruction/multi-treatment interference, and attrition. The issue of *maturation* involves the change in a subject due to the passage of time or aging. *History* involves the threat that events, occurring during the time of the study, may have on the subject's performance. These events may affect the subject's performance and make it difficult for the researcher to determine if it was the event or the intervention that caused a difference in the data (Kazdin,1983).

A lack of *procedural integrity/fidelity* is another of the treats to validity that can affect the design (Gast, 2010). This threat opens the study up for questioning on the correctness and consistency of the implementation of procedural steps. *Instruction* and *attrition* are threats that involve the actual instrumentation and the ability to comparatively analyze the subjects' data

with others along with the consistency of the sample size and keeping the participant throughout the entire study.

When designing a research study that combats the threats to internal validity, there are several procedural safeguards that should be in place (Gast, 2010). Issues with *maturation* and *history* can be detected with the use of a control task. By randomly probing the control throughout the study, I will have data that will help detect overall changes to the subject that could possibly be due to changes in the maturity of the subject over time and/or the lack of independence of the behaviors. The impact that *history* may have on the data may also be detected by probing the control throughout the study. Issues with *procedural integrity/fidelity* are controlled through the use of a procedural fidelity checklist (Gast, 2010). This checklist structures my evaluation of the implementation of each step so that retraining can occur if necessary. Concerns with *attrition* or the consistency of the participating subjects in the study will be addressed by arranging access to additional subjects if necessary. These subjects are those who could be randomly assigned to the study if one of the participating subjects drops out. *Instruction/multi-treatment interference* will be addressed by structuring the length of time between interventions. There will be at least one hour before and after the implementation of each intervention and the implementation of the control. Placing other activities in between should allow enough time to counter the effects of *multi-treatment interference*.

Issues with the external validity of a single subject design typically revolve around the selection of participants (Gast 2010). External validity will be monitored and controlled so that replication of the design can occur. I will follow stringent guidelines for the selection and randomization of both participants and materials. Participants will be randomly selected from the pool of available subjects with autism. A detailed description of participants will be provided

along with a description of the setting in which the study will take place. A detailed description of the materials used in the study will also be provided to allow for replication (Gast, 2010). In addition the study will also be designed to combat issues with reliability with the addition of a neutral observer to assist in the collection of inter-observer agreement data to strengthen the data collection process.

Choice of Design for this Study

Due to its ability to produce data showing the comparative effect of interventions, the method for this research was chosen to be a single subject adapted alternating treatment design. The two interventions to be compared are different, and the researcher's mission is to compare the two in order to determine the most efficient. Also taken into account was the fact that the behaviors are nonreversible. In order to adhere to the criteria recommended for methodological rigor of single-subject research (Horner et al., 2005; Busk & Serlin, 1992; Kratchowill & Stroiber, 2002), the *adapted alternating treatment single-subject* study will be designed to meet the following criteria:

- The *participants and setting* will be described with detail
- The *dependent variable* will be operationally defined; the data collection process defined for replication; data is quantifiably measured repeatedly over time; and inter-observer agreement will be established.
- The *independent variable* will be defined for replication, systematically manipulated, and implementation fidelity will be established.
- *Baseline* phases will be described with replicable accuracy and include repeated measurement of data points that can predict future performance.

- *Experimental control and internal validity* will highlight at least three demonstrations of treatment effect over three points in time, competing variables and hypothesis discussed, and the data results will document a pattern.
- *External validity* will be established through the experimental control being evidenced across participants, setting and materials.
- *Social validity* will be established through the creation of a design where the dependent variable is socially important, the implementation of the design is both cost efficient and implemented over an extended time period, and, in typical settings, the results prove to be socially important.

There are additional guidelines that are recommended when structuring an AATD single subject design. Gast (2010) recommends the following guidelines to further strengthen the methodological design:

1) Behaviors must be non-reversible.
2) Behaviors must not be within the student's current repertoire.
3) Behaviors must be discrete, and the completion of one should not be dependent upon another.
4) Behaviors must be functional equivalents.
5) Behaviors must be of equal difficulty.

Setting

All of the sessions and data collection for the study took place in a self-contained classroom at a center-based location in the Pickens County School District. The Pickens County school district is located in North Georgia with Jasper as the county seat. The Pickens County

Board of Education serves a total student population of approximately 4500 and has seven schools: four elementary, two middle, and one high school.

The center that will be used as the location is part of the Georgia Network of Educational and Therapeutic Support (GNETS) System. The GNETS System is comprised of 24 programs, which support the local school districts continuum of special education services for students with disabilities across the state of Georgia. The GNETS programs provide comprehensive educational and therapeutic support services to students who are significantly challenged in the area of emotional and behavioral disorders (EBD). Some programs also provide service to those students on the autism spectrum who are functioning at a severe level and who warrant a more restrictive placement.

There are 40 students, age 6 to 21, who receive special education services in the center. Of the 40 students, 15 are eligible with an autism diagnosis and are being served in three self-contained classrooms. The study took place in a self-contained classroom at the center, which was staffed with a teacher and a paraprofessional. In this classroom were three students, all with special education eligibilities in the area of autism.

The classroom was 24 by 19 feet, having one door opening to a small hallway, and several structured centers around the perimeter of the room. The centers were used for computer work, workbox tasks, calendar, morning group, vocational tasks, and had a table in the center of the group for the facilitation of group work. The teacher had a desk, and there were three other student desks in the center of the classroom. The room had several types of visual supports posted in addition to a central visual schedule organizing the student's day.

The context of the study was determined by the subjects at the center having a diagnosis of autism, my accessibility of the classrooms, and the willingness of the staff to participate in the study. I served as both the principal and one of the school psychologists on the center's clinical team. There was no coercion as to the participation in the research study, and the teaching team had the choice of whether or not they wanted to be included in the study. I gained permission from the school system for access to both the participants and the classroom. A formal written request was also submitted to the Institutional Review Board (IRB) of Kennesaw State University prior to implementation of the research. Before the implementation of the data collection process began, each participating member of the classroom staff and the parents of the participating subjects signed an informed consent (Appendix A) granting permission to include them in the study.

Sample

The sample was comprised of a total of three subjects diagnosed with autism. The study's participants also included two classroom staff members who implemented the procedural steps and assisted in the collection of data. There was an additional behavior specialist who assisted in the collection of inter-observer agreement data. The classroom was randomly selected from the three self-contained classrooms at the GNETS center that serve students with autism. The random selection was completed by numbering the three classrooms and randomly drawing a number from a basket. All of the staff members from the randomly selected classroom agreed to participate in the study.

Staff

The demographic information describing the two classroom staff members is summarized in the table below (see Table 1):

Table 1

Participating Staff Demographics

	Mrs. S.	**Mr. J.**
Position	Teacher	Paraprofessional
Gender	F	M
Age	39	23
Degree	B.S. (Psychology) M.S. (Community Counseling/Vocational Rehab)	B. A. (Special Education)
Certification	Provisional (Special Education)	None
Years at the Center	5	3
Total Years' Experience	11	3

In Mrs. S.'s 11 years' experience, two years were as a classroom teacher at the GNETS center, three years were as a paraprofessional at the center, and nine years were in a Vocational Rehabilitation center. Mrs. S. was provisionally certified as a special education teacher and planned to complete her coursework for full certification in July 2011. She had participated in several professional development courses in autism and behavior disorders in order to prepare her for the teaching assignment. The teacher was a willing participant in the research, served as the primary person to implement the design, and collected data.

The paraprofessional in the classroom, Mr. J., had served as a paraprofessional in the classroom for the last three years. He also worked after hours providing respite care for students

with special needs. Mr. J. had an undergraduate degree in Special Education but was not yet certified to teach. In preparation for this teaching assignment, Mr. J. participated in many of the professional development courses offered by the school system in the areas of behavioral interventions and crisis management. He was a willing participant in the study and served as the primary data collector.

Staff Training

One of the pre-implementation tasks completed for this research study was training for both the teacher and the paraprofessional. The training required two sessions and the agenda for the first session included the following:

- Specific information on the research study purpose
- Overall information about the timeline and design of the study
- Specific logistical information about all study phases, including the required materials, tasks, and visual supports
- Specific information regarding the data collection forms and process

The second session included time for practice of the prompting and data collection process. During this session inter-observer agreement (IOA) and procedural fidelity (PF) data was collected on ten mock trials using the behavior specialist who posed as the subject. The training and practice sessions continued until the inter-observer agreement reached a criterion level of 90% accuracy. Retraining was an option, if required, as I continued to monitor both IOA and PF throughout the research study, as described in the sections below. At the conclusion of

the training the staff completed an *Evaluation of Staff Training* survey as seen in Table 2 to determine the staff perceptions of the training. This form is also included in Appendix B.

Table 2

Evaluation of Staff Training

		Yes	No	Somewhat
1.	The training provided me with the information/materials I needed in order to participate in this study.			
2.	The trainer respected my schedule and presented the material in a manner that made the best use of time.			
3.	The information provided was presented in a manner that was easy to understand.			
4.	The training provided the material in a structured and organized manner.			
5.	The trainer patiently answered all of my questions and offered follow-up sessions if they are needed.			

Subjects

The demographic information for the subjects serving as the sample group for the study is contained in the table below (see Table 3):

Table 3

Demographics of Sample

	A	**J**	**T**
Gender	M	M	M
Grade	9	7	9
Date of Birth	5/11/95	10/14/97	6/30/92
Age	15-8	13-3	18-5
Special Education Eligibility	AU, MID, SI	AU, MID,SI	AU, MoID, SI
Initial Placement	1998	2001	1996
Years in Special Education	12	9	11
Initial Center Placement	1999	2004	2007
Professional Making Diagnosis	School Psychologist	School Psychologist	Psychiatrist (Marcus Center)
Assessments Used	CARS, Vineland, Battelle, Bayley	CARS, Vineland, Binet-IV	CARS, Vineland
Date of Last Psychological	4/09	8/08	10/10
Cognitive Score	60 (TONI-3)	64 (CTONI)	52 (RIAS)
Autism	(CARS) 31 mild/mod	(ADOS) Met cutoff	(CARS-2) 32 mild/mod

KEY: AU: Autism; SI: Speech/Language; MoID: Moderately Intellectual Disability; CARS: Childhood Autism Rating Scale; TONI-3: Test of Nonverbal Intelligence-Third edition; Vineland: Vineland Adaptive Behavior Scales; Battelle: Battelle Developmental Inventory; Bayley: Bayley Scales of Infant Development, Second Edition; Binet-IV: Stanford Binet Intelligence Test-4th edition; RIAS: Reynolds Intellectual Assessment Scales.

All subjects have diagnoses in the area of autism and all have cognitive impairments. More specific information about each of the subject's level of functioning is included in the section below.

Subject A

Subject A was a 9th grade young man, age 15-years 8-months, who was diagnosed with both autism and a chromosomal abnormality on the 8th chromosome. Subject A demonstrated a significant impairment in both expressive and receptive language. He received speech/language services and, even though Subject A demonstrated the ability to use his words to orally communicate using one or two word sentences, he spoke only when directly prompted by an adult. Subject A demonstrated independent adaptive skills such as dressing and toileting and eating but required several verbal and gestural prompts from the staff in order to complete tasks. Even though he was initially referred for service in the GNETS program for noncompliant behaviors, in the structured classroom setting where he was being served, his behaviors were not impacting his ability to progress. Subject A's behaviors did not influence his participation and performance in the study.

Subject J

Subject J was a 7th grader, 13-years 3-months old and diagnosed with autism. Subject J began receiving special education services at the age of three from the *Babies Can't Wait* Early Intervention program. In 2004, Subject J was referred to the GNETS program due to significant behavioral issues in the classroom setting. In 5th grade Subject J's behaviors progressed so that he was recommended to return to a less restrictive setting in a local school by the Individual Educational Program (IEP) committee. In 2010, J. began demonstrating significant behaviors in the self-contained classroom at the middle school and was referred back to center for placement in a more restrictive setting. Even though Subject J demonstrated the ability to communicate orally, he received speech/language services to enhance his ability to use and understand oral language. He demonstrated independent adaptive skills such as dressing, toileting and eating and

required only a few verbal and gestural prompts from the staff in order to complete academic tasks in the classroom setting. Even though Subject J was referred back to center by the IEP committee for service in the program, he had not exhibited any of the referring behaviors since his return and behavior was not impacting his ability to access learning. Subject J.'s behavior did not influence his participation and performance in the study.

Subject T

Subject T was a young man, 18-years 5-months old, diagnosed with autism, a cognitive delay, and a visual impairment. He received speech/language services and exhibited a significant speech impediment. Subject T was difficult to understand unless the listener was familiar with him. Subject T also had a visual impairment and received consultative services in the area of vision. The vision specialist recommended that all materials be enlarged to a 4 x 6 size in order to accommodate for his disability. Subject T demonstrated independent adaptive skills such as dressing, and toileting but had significant eating issues as demonstrated by having only a limited number of foods he would eat. Even though he was referred for service to the center program for noncompliant behaviors, he had not exhibited any of the referring behaviors while in the structured autism classroom setting and his behaviors were not impacting his ability to academically progress. Subject T. was also served as a student with a visual impairment but, according to the vision specialist, this disability did not affect his ability to function and perform academic tasks in the classroom setting, if accommodations were in place. Neither Subject T.'s behavior nor his visual impairment affected his ability to participate and perform tasks in the study.

Ethical Considerations

In order to ensure the protection of each participant in the research study, each staff member was asked to sign informed consent in order to participate in this study. The parents or guardians of each of the three participating subjects also signed an informed consent giving permission for the subjects to participate. I completed the Protection of Human Research Participants Certification Test and submitted paperwork to the Institutional Review Board of Kennesaw State University and the GNETS center in order to seek permission for human subject research. Upon completion of the research study, a debriefing occurred with all participating staff members. A copy of the research results was provided to the administrative staff members who oversaw research being conducted in the school system. Confidentiality was maintained for all subjects in this study. The research was designed so as to follow the established curriculum needs and the Individual Educational Program (IEP) of each participating subject and no harm came to the participants.

My role in this study was as an impartial observer, trainer, data collector and staff member implementing the interventions for a portion of the sessions. As the researcher, I created the visual supports for the interventions, created and organized all materials needed for the tasks involved in the study, collected data sheets from the classroom on a daily basis, and collected both IOA and PF data. I serve as the principal and as one of the psychologists on the clinical team for the NorthStar Center and was on location at the center where the classroom was located.

Tasks and Materials

There were three tasks designed for use in the study. These tasks were chosen with information from the classroom staff and each was comparable in complexity relative to the subject's ability and to each other. Each of the tasks was assessed by presenting the steps of the task from the study and a task very similar, to the subjects prior to the implementation of the study. This task assessment was used in order to determine the subject's ability to complete each of the steps of the task. I also observed the subjects complete tasks in the classroom and discussed the subject's ability to completed similar tasks with the classroom staff. I asked several questions while assessing the ability of the subjects, such as; do they have the fine motor skills needed to use the manipulatives included in the tasks; do they have the ability to understand the requirements of the task; and do they have the receptive language skills required in understanding teaching and prompting from the staff. Each of the subjects demonstrated the ability to perform the steps to each of the tasks but did not present with the ability to independently link the sequence of the steps together. The visual activity schedule was designed to enable the student to link the steps, not teach the task. Table 4 provides a general description of each of the tasks.

Table 4

Description of Subject Tasks

Tasks	General Description
1	Setting a table Placing placemat, plate, cup, napkin, fork and spoon in proper place on a table
2	Making school box kits Placing items in a certain order into school boxes (pencil, pen, highlighter, crayons, eraser, pencil sharpener)
3	Filing papers Filing papers labeled with an alphabet letter in the folder labeled with corresponding letter.

Each task had a comparable number of items or materials that had to be manipulated by the subjects. The tasks were comparable in level of physical requirements (i.e.; fine motor/gross motor), amount of movement required, number of steps involved, and the complexity of the steps. Each of the three tasks was divided into discrete steps, each step having its own photographic visual support. Table 5 provides the analysis for the three tasks.

Table 5

Task Analysis/Response Definitions for Tasks

	Task 1 **Setting the table**
1.	Get crate of materials from bookshelf
2.	Place crate of materials onto table
3.	Lay out placemats at each place
4.	Lay out plates at each place
5.	Lay out cups at each place
6.	Lay out napkins at each place
7.	Lay out fork at each place
8.	Lay out spoon at each place
9.	Place materials back into crate

	Task 2 **Making School Box Kits**
1.	Get crate of materials from the bookcase
2.	Place crate onto work table
3.	Place school boxes at each place at table
4.	Place pen in each box
5.	Place pencil in each box
6.	Place eraser in each box
7.	Place glue stick in each box
8.	Place pencil sharpener in each box
9.	Place box of crayons in each box
10.	Place materials back in crate

	Task 3 **Filing papers**
1.	Get crate of materials from bookcase
2.	Place the crate of materials on the table
3.	Place folders at each place at the table
4.	Place papers with alphabet letters into folders with corresponding letters on front
5.	Place all materials back into crate

Each of the tasks used in the study was randomly assigned to one of the two interventions or to the control task. Randomization occurred in order to control the threat to external validity. This selection took place prior to the implementation of the baseline phase and the pairing of task to intervention or the assignment of the control task remained constant throughout the study. The random assignment was completed by having one of the staff member draw straws. Each straw was marked I_1 (Intervention 1), I_2 (Intervention 2) or C (control task) and the staff member drew one for each of the three tasks per subject. The tasks were completely randomized for the first subject but there was not complete randomization for subjects two and three. Complete randomization was not possible after tasks were assigned to the first subject because the same tasks could not be selected and paired with the same intervention or as the control task for two different subjects.

Tasks were randomly assigned to the second subject making sure that there was not duplication with subject one. Random assignments were then made for subject three making sure the tasks were not the same as assigned for subjects one and two. The random assignment is documented in the chart below (Table 6). A blank chart is also included in Appendix C.

Table 6

Random Assignment of Task to Intervention

Subject	Random Assignment of Task to Intervention		
	Task 1 *Setting Table*	**Task 2** *Making Schoolbox Kits*	**Task 3** *Filing Papers*
A	I_2	I_1	C
J	I_1	C	I_2
T	C	I_2	I_1

I_1 (Intervention 1): Photos of the materials in the completed step
I_2 (Intervention 2): Photos of the Subject demonstrating the completed step
C (Control)

Each of the interventions, were also randomly assigned to the morning or afternoon sessions. The randomization of intervention to morning/afternoon sessions was completed by drawing straws marked AM and PM. The straws were associated with the intervention. I also made sure that there was no more than two consecutive sessions having the same interventions. The control task was also randomly assigned being careful that there was at least one hour between running a control task session and an intervention session.

The random selection of interventions to morning/afternoon sessions was completed prior to baseline and a chart was used to guide in my preparation for implementation of the sessions.

Tables 7, 8 and 9 show each Subject's assignments of interventions for the AM/PM sessions of each day. A blank chart is included in Appendix D.

Table 7

Random Assignment of Interventions to AM/PM Sessions for Subject A

Subject A	Days/Sessions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I_{1} (MATERIALS)	A	P	P	A	P	A	P	A	A	P	P	A	P	A	P	A
I_{2} (MODEL)	P	A	A	P	A	P	A	P	P	A	A	P	A	P	A	P
Control	P	A	A	P	A					P				A		

Subject A	Days/Sessions															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
I_{1} (MATERIALS)	A	P	P	A	P	A	P	P	A	P	A	A	A	P	P	A
I_{2} (MODEL)	P	A	A	P	A	P	A	A	P	A	P	P	P	A	A	P
Control	A						P				P				A	

AM: Morning Session
PM: Afternoon Session
I_{1}: Intervention 1
I_{2}: Intervention 2

Table 8

Random Assignment of Interventions to AM/PM Sessions for Subject J

Subject J	Days/Sessions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
$I_{1\ (MATERIALS)}$	P	P	A	P	P	A	A	P	P	A	A	P	P	A	A	P
$I_{2\ (MODEL)}$	A	A	P	A	A	P	P	A	A	P	P	A	A	P	P	A
Control	A	P	P	A	P			A				P				A

Subject J	Days/Sessions															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
$I_{1\ (MATERIALS)}$	P	A	A	P	P	A	A	P	P	A	A	P	P	A	P	A
$I_{2\ (MODEL)}$	A	P	P	A	A	P	P	A	A	P	P	A	A	P	A	P
Control		P				A						A				P

AM: Morning Session
PM: Afternoon Session
I_1: Intervention 1
I_2: Intervention 2

Table 9

Random Assignment of Interventions to AM/PM Sessions for Subject T

Subject T	Days/Sessions															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
$I_{1\ (MATERIALS)}$	A	P	P	A	P	P	A	A	P	A	P	A	A	P	A	P
$I_{2\ (MODEL)}$	P	A	A	P	A	A	P	P	A	P	A	P	P	A	P	A
Control	A	P	A	P	A			P					A			

Subject T	Days/Sessions															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
$I_{1\ (MATERIALS)}$	A	P	P	A	P	A	P	P	A	P	A	A	P	A	A	P
$I_{2\ (MODEL)}$	P	A	A	P	A	P	A	A	P	A	P	P	A	P	P	A
Control	A				P			A				P				P

AM: Morning Session
PM: Afternoon Session
I_1: Intervention 1
I_2: Intervention 2

Materials

There were four different types of materials used in this study:

- Materials used for the tasks
- Photographic visual supports used for each step
- Data collection forms
- Timer or clock with second hand

Specific materials required for each of the tasks and the locations where they were kept are given below in Table 10.

Table 10

Materials Required for Tasks

Task	Materials	Location Materials are Housed	Location of Visual Supports During Work Task
	Setting a table		
1	Access to table, 6 placemats, 6 plates, 6 cups, 6 napkins, 6 forks, 6 spoons, crate to hold materials and basket for placement of *finished* visual support photos.	On bookshelf in classroom	Placed on cabinet doors beside the work area.
	Making school box kits		
2	Six plastic pencil boxes, 6 pencils, 6 pens, 6 highlighters, 6 erasers, 6 pencil sharpeners, 6 glue sticks, 6 boxes of crayons, access to table top work area, crate to hold materials and a basket for placement of *finished* visual support photos.	On bookshelf in classroom	Placed on cabinet doors beside the work area.
	Filing papers		
3	Desktop file holder with 6 slots, access to table top work area, 6 sets of papers with labeled with 6 different alphabet letters, 6 folders labeled with alphabet letters, crate to hold materials and a basket for placement of *finished* visual support photos.	On bookshelf in classroom	Placed on cabinet doors beside the work area.

Photographic Visual Supports

In addition to the specific materials required for the tasks, this study also required the use of photographic visual supports. I created the visual supports with assistance from the classroom staff.

Two types of visual supports were used:

- *Materials Intervention*: A strip of poster board with a photo of each of the completed steps with the material used in the step (i.e., placemat, plates, napkins, etc.). The photos were 4 x 6 inches in size in order to accommodate for any potential issues with the visual disability of Subject T. Even though only one

student required the enlarged size of the photos, for consistency, all photographic visuals for Subjects A, J and T were enlarged to the 4 x 6 inch size. Examples of the 4 x 6 inch photos for Task 1 include: placemat already placed on table; fork already beside plate; cup already placed on table, etc. Appendix E shows an example of this intervention visual.

- *Model Intervention:* A strip of poster board with a photo of each of the steps depicting the student being staged as if completing the step using the materials (i.e., student putting out placemats on the table). The photos were enlarged to 4 x 6 inches in order to accommodate for any potential issues with the visual disability of Subject T. Again, for consistency, all photographic visuals for Subject A, J and T were enlarged to the 4 x 6 size. Photographs were taken of all three subjects modeling the completion of each step of the intervention phase of the study. This ensured that each subject had photographic visuals showing himself completing the steps of the task. Each step of the task was consistent with the task analysis indicated in Table 8.

Each subject's visual support was created from the task analysis provided in Table 8 and each subject had a group of two visual supports for each task. Each photo was printed in both color and in black and white. The strip of poster board was 2 ft long by 8 inches wide and the black and white photo was glued on the cardboard in the order indicated on the task analysis. The strip was then laminated and small pieces of Velcro placed on top of each black and white photo. The 4 x 6 inch colored photos were cut out, individually laminated, and small pieces of Velcro were placed on the back. The colored photos were to be placed on top of the matching black and white photo. This is typical of visual supports and is designed so that the subject can return the

photos to the correct placement after the task is completed. As the subject completed each step of the tasks, he removed the photo from the strip and placed it in a basket on the work table. During the teaching of the task, the visual supports were affixed on the wall above the work area.

Procedures

This section provides the reader with the procedures used in the study. The procedures are divided into four phases: baseline, intervention, probe and best alone. Each will have the procedural steps and data collection forms specific to that phase.

Baseline Phase Procedures

The baseline phase of the research design began during the morning session of the first day. I took data along with the teacher and paraprofessional in order to gather inter-observer agreement data (IOA). Random selection of tasks, time of session, and which subject would be first had already been completed prior to the phase.

It should be noted that during this phase the procedures were consistent for all three tasks, which included the control task. No visual supports were used; however, both types of visual supports were located on a table in the classroom away from but visible from the work area.

The specific steps followed during the baseline phase are outlined as follows:

1) All materials were organized in the classroom and the tasks were placed on the shelf in the work area. All persons collecting data had the correct data collection forms for each subject and task. A timer was also made available.
2) The teacher was positioned and ready to work with the subject while the paraprofessional and I prepared to collect data. I also had the *procedural fidelity checklist* on a clipboard so that PF data could be taken.

3) The teacher called the subject to the work area. Once he was in the work area, the teacher gave the initial verbal direction to begin the task. Each directive was provided on the data collection form as it was specific to the task.
4) Table 11 indicates the specific instructions the teacher followed dependent upon the response of the subject. A timer was used to determine if the subject correctly responded to the directive within the five second time frame. This form was also part of the PF checklist I used to determine the correctness of the steps of the design.

Table 11

Baseline Procedures

Does Complete the Step w/in 5 second time frame	**Does NOT** Complete the Step w/in 5 second time frame
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task, within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.
This form continued for each step of the intervention task.	

Table 12 shows an example of the *Student Performance Data Collection Form* that was used to record each subject's response to the Setting Table task during the baseline phase. This specific form is included in Appendix F. All other student performance data collection forms are included

in Appendices F - L. It is important to note that the data collection form used during the baseline phase and for the control task was different from those used during the other phases.

Table 12

Student Performance Data Form for "Setting Table": Baseline Phase and Control Task

Observe the Subject and circle "I" (Independent) if the subject completes the step and "No" if they do not.
For the directive say "It's time to set the table"

Task 1: Setting the table	Is Subject Independent?		Comments
Get crate of materials from bookcase	I	No	
Place crate of materials on table	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Put materials back in crate	I	No	

There were two data response options using the *Student Performance Data Collection* form used during the baseline phase and for the control task. These options are "*I*" which indicated that the subject completed the trial independently within a five second time frame and "*No*" indicating the subject was not able to independently complete the trial within the five second time frame. There were different data collection forms for each task.

These same procedures continued for until the subject moved into the intervention phase. The criterion for moving to the intervention phase was a stable trend of at least three data points, which followed the guidelines for baseline phases in an AATD research design outlined by Gast (2010). The procedures and data collection form used for the baseline phase continued into the intervention phase for the control task only.

Intervention Phase Procedures

The randomization of task to intervention and to time of day was both completed prior to the implementation of the study. The focus of the intervention phase was to systematically teach the use of the intervention visual support to the subject. Procedures for the control task during the intervention phase remained the same as during the baseline phase. No visual support intervention was used with the control task but they were both present in the vicinity of the work area. The control task was randomly probed at least two times during this phase. The scheduled use of the control task was at least one hour pre or post intervention task. This was to control for treatment interference. Intermittent verbal reinforcement was used with each subject, non-contingent upon performance.

The specific steps implemented during the Intervention phase are outlined as follows:

1) All materials continued to be on the shelf in the work area consistent with the baseline phase. All persons collecting data had the intervention data collection forms for each subject and task on clipboards. A timer or a clock with a second hand was also made available. One of the visual supports was placed on the wall above the work area and was dependent upon which intervention (*materials* or *model)* was being taught.
2) The teacher was positioned and ready to work with the subject while the other data collectors were prepared to collect data. The neutral observer data was used during several sessions in order to collect *inter-observer agreement* (IOA) data. The data sheet used was dependent upon which task was used with the intervention. I also took procedural fidelity data during this phase.
3) The teacher called the subject to the work area and, once in the work area, gave the initial verbal direction to begin the task. Each directive was provided on the data collection form as it was specific to the task.
4) Table 13 shows the specific instructions for teaching the intervention dependent upon the subject's response.

Table 13

Intervention Procedures

If the subject DOES COMPLETE the step of the task	If the subject DOES NOT COMPLETE the step of the task
☐ Circle *I* indicating independence and let subject continue to next step without saying anything.	☐ Use *least to most* prompt levels (as indicated on the data sheets) until the subject completes the step. These prompts include: **Verbal, Gesture, Partial Physical, Full Physical.** There is a 5 second wait time between prompt and move to the next prompt. Wait for compliance until circling the prompt level required for compliance. Teach the task in four distinct steps: ☐ Say "Look at the pictures" ☐ Do the step ☐ Take the photo of that step from the visual activity schedule ☐ Place the photo in the pouch/basket ☐ After the completion of these four steps the subject can move onto the next step of the task.
☐ *The following verbal directive **can be** given at each step if the subject does not move on by himself "Look at the Pictures" while point to the photographic visual support.*	☐ If the subject completes the step wait to see if the subject moves to the next step by himself by looking at the visual activity schedule.

As indicated in the procedures, the teacher moved from the least restrictive to the most restrictive prompt levels as the intervention was taught. The definitions for these prompt levels were provided on the back of the data sheet and are provided in Table 14.

Table 14

View of the back of the Data Collection Form

Key		
I	Independent	Subject uses the visual support to complete the step with only the initial verbal direction.
V	Verbal	Using a specific verbal directive ("Look at the picture") to prompt the subject to use the visual support
G	Gestural	Using a point or wave toward the photos in order to prompt the subject to use the visual support
PF	Partial Physical	Using a touch on the subject's arm/hand, in order to prompt the subject to use the visual support
FF	Full Physical	Using hand over hand with the subject in order to prompt the subject to use the visual support

Intervention 1: Photos of the materials only
Intervention 2: Photos of the subject doing the task
Task1: Setting the Table
Task 2: Making School Box Kits
Task 3: Filing Papers

Table 15 provides an example of the *Data Collection Form* used to document student performance on the *setting table* task during the intervention phase. This form is included in Appendix I. This data form was only used when the interventions were taught to the subject. The data collector completed one data sheet per session per subject. This provided me with the necessary information so that analysis of the data could be accurately completed.

Table 15

Student Performance Data Form for "Setting Table: Intervention/Probe and Best Alone Phases

For the initial directive say "It's time to set the table."
Observe the Subject and circle the prompt that was required for completion of the step.
Circle "I" if the student was independent in completing the step with no prompt.

Task 1 **Setting the table**	**Prompt Required**					**Comments**
Get crate of materials from bookcase	I	V	G	PP	FP	
Place crate of materials on table	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Put materials back in crate	I	V	G	PP	FP	

During the intervention phase, the control task was also probed. The procedures and data collection form used during the baseline phase were used with the control task. No teaching of either intervention was used with the control task, but both types of visual supports were in the vicinity of the work area.

The subject remained in the intervention phase until he met criteria using one of the interventions. The criteria that determined the more efficient intervention was when one intervention produced 100% correct responses, unprompted, over three consecutive sessions (Gast, 2010).

Probe Phase Procedures

The move to the probe phase occurred after the more efficient intervention strategy met criteria. The purpose of the probe phase was to assess maintenance on tasks that reached criteria and for continued instruction on the less efficient intervention.

During this phase, the most efficient intervention continued to be taught for one to two randomly spaced sessions in order to assess for maintenance. The data collection form and procedures continued to follow those used during the intervention phase. The less efficient intervention continued to be taught until criteria was met, using the same procedures and data collection forms as during the intervention phase. The control task was randomly probed during this phase. The scheduling of the control task continued to be at least one hour prior to or after the intervention task was taught in order to control for multi-treatment interference. The same procedures and data collection forms were used for the control task as were used during baseline and the intervention phases.

A move to the best alone phase did not occur until the less efficient intervention reached criteria or until the less efficient intervention had been taught for at least "1.5 to 2 times the number of sessions it took the more efficient strategy to reach criterion" (Gast, 2010, p. 360).

Best Alone Phase Procedures

The move to the best alone phase occurred after meeting the criteria outlined above. There were two goals for this phase; one to teach the control task using the more efficient intervention strategy in order to gather data on generalization and the other for intra-subject replication (Gast, 2010).

Maintenance data were also gathered on the more efficient intervention by randomly probing using the same procedures from the intervention phase. If the less efficient intervention met criteria during the probe phase, then it was also randomly probed for maintenance. During the probe phase, the less efficient intervention would continue to be taught using earlier procedures as implemented in the intervention and probe phases. If the intervention does not meet criteria after continuing to teach 1.5 to 2 times the number of sessions it took the more efficient intervention to reach criteria the study will end. The end of the study occurred when criterion was met on the control task or on the last day of the school year.

Data Analysis

Data were used to either reject or fail to reject the null hypothesis. Six types of data were used and these formats are as follows:

- Visual analysis of the graphed subject performance data.
- Sessions to criteria
- Percentage of non-overlapping data points

- Procedural fidelity
- Inter-observer agreement
- Social validity

Visual Analysis of Graphed Subject Performance Data

Subject performance data was derived by calculating the percentage of correct responses per session. Each percentage was graphed by session and subject, and the graphs are provided in Chapter 4.

An analysis of the subject performance data was completed and discussed in narrative form in Chapter 5. Through the visual analysis, there were several questions considered in order to determine efficiency. These are as follows (Gast, 2010, p. 362):

- Were there differences in data for the interventions?
- Were the differences across interventions consistent across subjects?
- Were the differences large enough to have a clinically functional difference?

Sessions to Criteria

Sessions to criteria data was calculated by counting the number of sessions that were required before the intervention reached criteria. The number of *sessions to criteria* was determined by, beginning in the intervention phase, counting the number of sessions the intervention was used until it reached criterion, which was defined as three consecutive sessions reaching 100%. Separate results for each subject were given showing the number of *sessions to criteria* during the best alone phase of the study. This data were determined by counting the number of sessions required to reach criteria on the control task after the most efficient intervention was implemented during the best alone phase.

Percentage of Non-Overlapping Data Points

The percentage of non-overlapping data points (PND) (Gast, 2010) is a basic statistic used in the visual analysis of data. It is calculated as a percentage of data points that do not overlap and was calculated in this study to determine the strength of the two interventions. The PND was calculated by comparing the first data point of Intervention I (materials) to the first data point of Intervention II (model) and each of the control data points to the closest point of intervention. Each data point was compared in like manner until all points within the intervention phase were analyzed. Gast (2010) states that the higher the PND, the greater or stronger the impact of the intervention that was superior.

Procedural Fidelity

To verify procedural fidelity, I completed procedural fidelity checklists for several of the sessions. A percentage of accuracy was calculated by dividing the total by the number of steps from the checklist that were completed correctly by the total number of steps. A percentage of 90% was used as the accepted standard (Gast, 2010). During baseline, 100% of the sessions were observed and 30% of the other phases were observed. The checklists were different, dependent upon the phase in which they were used. These forms are provided in Appendices M – P. The steps included on the *Baseline Procedural Fidelity Checklist* are shown in Table 16 and included in Appendix M.

Table 16

Procedural Fidelity Checklist: Baseline

Baseline/Control Task Procedural Fidelity Checklist

- ☐ All materials are organized and in location. The visual supports for each Intervention and Control task are in the area but not used during Baseline.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready for use.
- ☐ The staff member is positioned and prepared to collect data.
- ☐ The staff member working with the subject gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

Does Complete the Step w/in 5 second time frame	**Does NOT** Complete the Step w/in 5 second time frame
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle "No" and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.

The *Procedural Fidelity Checklist* for the intervention teaching phase is included in Table 17 and in Appendix N. This checklist provides a detailed description of the steps followed during all phases that involved teaching the interventions.

Table 17

Procedural Fidelity Checklist: Intervention

Intervention Procedural Fidelity Checklist

- ☐ All materials are organized and in location. If the task has been assigned as the Control, no visual support is used but continues to be in the vicinity of the work area. The visual support used for the Intervention is affixed to the wall above the work area.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready.
- ☐ The staff member is positioned and prepared to collect data.
- ☐ The staff member working with the subjects gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

If the subject DOES COMPLETE the step of the task	If the subject DOES NOT COMPLETE the step of the task
☐ Circle *I* indicating independence and let subject continue to next step without saying anything.	Use *least to most* prompt levels (as indicated on the data sheets) until the subject completes the step. These prompts include: **Verbal, Gesture, Partial Physical, Full Physical.** There is a 5 second wait time between prompt and move to the next prompt. Wait for compliance until circling the prompt level required for compliance. Teach the task in four distinct steps: ☐ Say "Look at the pictures" ☐ Do the step ☐ Take the photo of that step from the visual activity schedule ☐ Place the photo in the pouch/basket ☐ After the completion of these four steps the subject can move onto the next step of the task.
☐ *The following verbal directive **can be** given at each step if the subject does not move on by himself "Look at the Pictures" while point to the photographic visual support.*	☐ If the subject completes the step wait to see if the subject moves to the next step by himself by looking at the visual activity schedule.

Inter-observer Agreement

"In order to ensure data collection objectivity, independent observers periodically check the accuracy of measures using the same definitions and recording procedures used by the primary observer" (Gast, 2010, p. 15). I assessed inter-observer agreement (IOA) by observing 100% of the baseline phase and 20% of all other sessions and using the same *Data Collection Forms* as the classroom staff. A neutral observer was also involved in observing four randomly chosen sessions. The percentage of IOA was calculated by dividing the number of agreements on specific data points to the total number of data points selected, then multiplying the total by 100. Inter-observer agreement of 90% or above indicates an acceptable level of accuracy. The data are provided in narrative form in Chapter 4.

Social Validity

At the conclusion of this research study, I collected *social validity* (SV) data from the participating staff members in order to determine their perception of the results or outcomes of the research. The goal of the survey was to assess social validity for the intervention goal, the research design and procedures, and the perceived outcome of the study (Gast, 2010). Social validity has been deemed an important part of the research process (Baer, Wolf & Risley, 1968 and Wolf, 1978). Wolf (1978) recommends researchers obtain SV data on the *goals, procedures* and *effects* of the research study. In terms of SV, the following quality indicators were recommended (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005) for single subject research:

- The dependent variable is socially important.
- The change in the dependent variable with the implementation of the intervention must be socially important.

- The practicality and cost effectiveness of the intervention be monitored.
- The contexts, location and entity implementing the interventions are typical and monitored over an extended period of time.

Table 18 and Appendix Q provide the survey questions the staff completed at the end of the study. The *Social Validity Survey* used a Likert rating based on a scale of 1 to 5, ranging from *strongly agree* to *strongly disagree*. Each staff member completed a scale for each of the three subjects. The surveys were provided to the raters at the conclusion of the research study. The *Social Validity Survey*, created using the quality indicators outlined by Horner, Carr, Halle, McGee, Odom and Wolery et al. (2005), provides the reader with the survey questions that are used to gather social validity data. Horner et al. (2005) states "Impressive efforts exist for quantifying the methodological rigor of specific single-subject studies (p. 173) (Busk & Serlin, 1992; Kratochwill, & Scoiber, 2002). The *Social Validity Survey*, included in Appendix Q, is shown below:

Table 18

Social Validity Survey

	Questions
1	The dependent measure (ability to independently complete tasks) is an important skill in the life of the student.
2	The student can actually do the dependent variable (ability to independently complete tasks) by himself well enough to get the desired effect and is that effect valued by others?
3	The intervention used is practical and cost efficient.
4	The use of photographic visual supports could be easily implemented in the classroom in several different areas.
5	The results from the study provide important information for future research in the area.

Horner, Carr, Halle, McGee, Odom, & Wolery (2005)

The data from the surveys provided in Table 20 were analyzed and a mean score by subject for each question was calculated by dividing the combined rating of all completed surveys by the total number of surveys completed. A total mean score by survey question was yielded by calculating all question scores across subjects and dividing by the total number of surveys completed. The data are presented in Chapter 4. The data from the *Social Validity Survey* use the Likert scale in a numerical format. The data are provided in Chapter 4 and discussed in narrative form in Chapter 5 (Reimers & Wacker, 1988).

Summary

Researchers have agreed that the most pervasive of the learning weaknesses of students with autism are difficulties with communication and socialization (Autism Society of America, 2007). The use of concrete visual supports and visual activity schedules, as represented by photographic or pictorial representation of objects or events, are important in accommodating for those weaknesses (Chiang, Soong, Lin, & Rogers, 2008).

The purpose of this study was to compare the efficiency of two types of photographic visual supports: one depicting the materials used in the completion of steps to a task and the other of the student modeling steps to a task. This study contributed to the body of research in this area by providing additional data as to the comparative efficiency of two specific types of visual supports and further ground one of the most widely used areas of interventions for students on the autism spectrum.

CHAPTER 4

RESULTS

The purpose of this study was to compare the efficiency of two types of static photographic visual supports with subjects diagnosed with autism. Efficiency was defined for this study as the effectiveness of interventions in assisting subjects complete tasks to mastery as measured by 100% level across three consecutive sessions. The focal research question was: *What are the comparative effects of using a photographic visual support that depicts only the materials needed to complete each step to a photographic visual support that depicts the subject demonstrating or modeling the steps to the task on the acquisition of independent performance of multi-step tasks by students with autism?*

My hypothesis (H) was *the use of a photographic visual support that includes the subject demonstrating/modeling steps of the task will reach criteria before the use of a photographic visual support that includes a photo of only the materials used in the completed step to the task.* The null hypothesis (H_o) was: *there will be no difference in the efficiency of the two interventions and both will reach criteria at the same time.* Based on the data, I rejected both the hypothesis (H) and the null hypothesis (H_o). The data indicated that there was a comparative difference in the efficiency of the two interventions with the intervention using a visual of materials being the most efficient, regardless of the task or the subject.

I also focused the research to answer the following sub-questions:

1) What was the difference in the efficiency of the two types of visual supports in assisting subjects to independently complete the sequential steps of a task and reach set criterion?
2) Which was found to be the most efficient type of visual support in the acquisition of independent work skills on multi-step tasks?
3) What was the difference in the maintenance and generalization between the two interventions?

Efficiency, determined by the visual analysis of graphed data, was defined as which of the interventions reach criteria first. The criteria were set at three consecutive data points at 100%. Efficiency was determined by examining and comparing the following:

- which intervention met criteria first as determined by graphed subject performance data
- difference in the number of sessions to criterion
- percentage of non-overlapping data points (PND)
- presence of maintenance
- presence of generalization

Reliability was established by collecting data on *procedural fidelity* and *inter-observer agreement. Social validity* data were gathered through the use of a survey completed by the teacher and the paraprofessional.

Research Data

The data were reduced and graphed for ease of the visual analysis process. The following results are presented and will address the research questions and hypothesis: (1) Graphed *subject performance data* for each of the three subjects, indicating performance on tasks across four phases of the research project; (2) tabled data indicating number of *sessions to criteria* by

subject; (3) *percentage of non-overlapping data* points between interventions for each subject; (4) percentage of *procedural fidelity* across raters; (5) percentage of *inter-observer agreement* data; and (6) *social validity* data from the teacher and the paraprofessional.

Subject Performance Data

The performance data are presented in graphed format by subject. Each graph depicts data from the four phases of the research project: (1) baseline; (2) intervention; (3) probe; (4) best alone. The results are given as percentage of mastery of trials per task for each session. Each of the two interventions are depicted and shown as separate symbols. The two interventions are defined as follows:

- *Materials Intervention:* visual support making use of photographs of only the materials used in the completion of steps of the task.
- *Model Intervention:* visual support making use of photographs of subject performing the steps of the task.

Subject A

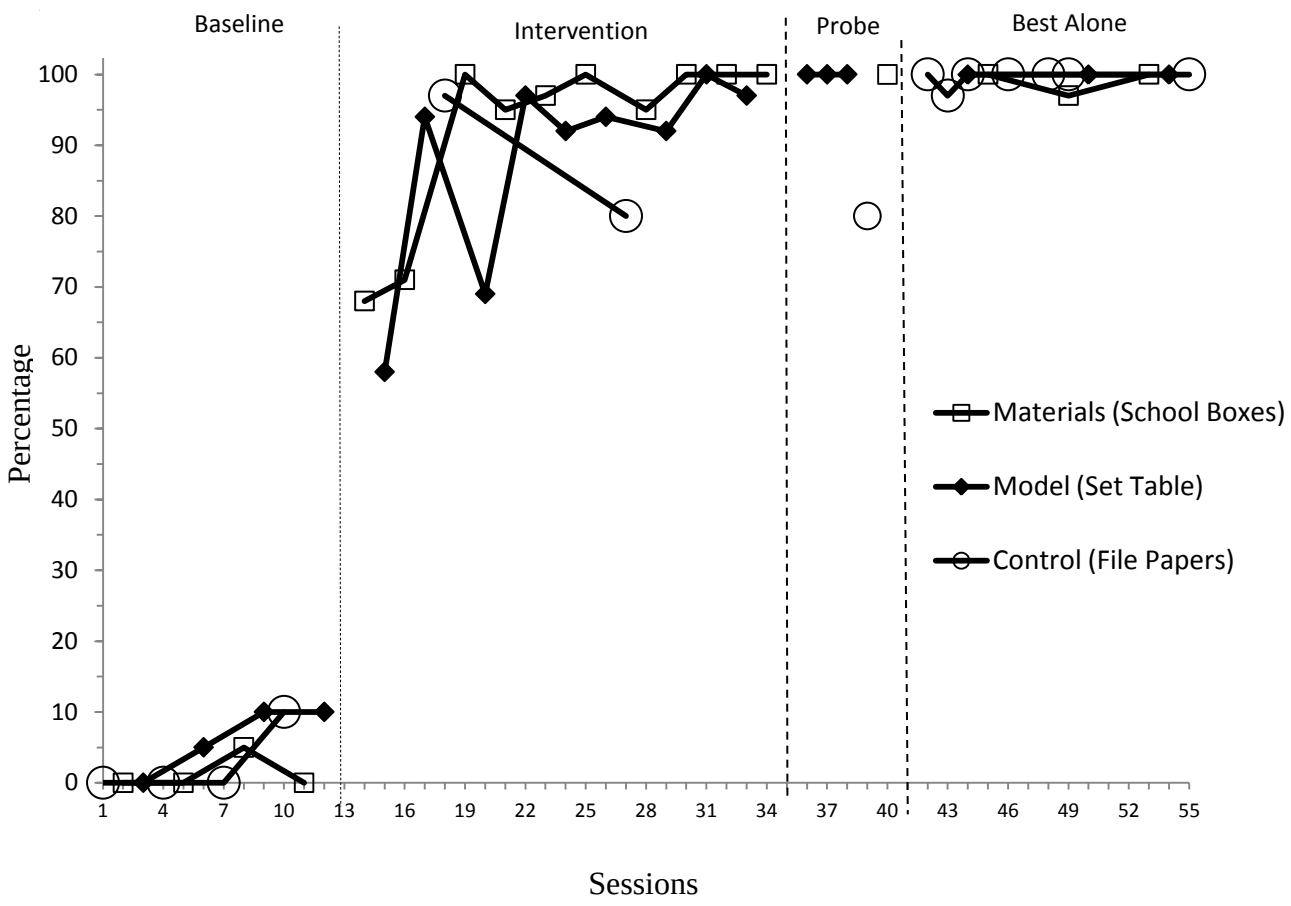
The random assignment of tasks to intervention/control for Subject A was as follows:

- Intervention 1 (Materials): Making School Boxes
- Intervention 2 (Model): Setting the Table
- Control Task: Filing Papers

Figure 4 contains the data for Subject A.

Figure 4

Percentage of Mastery of Trial Steps for Subject A



During the baseline phase, subject performance took place without implementing either of the interventions. Both sets of visual supports were present and placed on a table in view from the work areas but were not taught. The subjects were provided with verbal reinforcement non-contingent upon performance. Data for Subject A using the *materials* intervention reflected three data points at 0% mastery and one data point at 10% mastery. Data for the *model* intervention

reflected one data point at 0% mastery, one at 5% mastery, and two at 10% mastery. Data for the control task (filing papers) yielded three data points at 0% mastery and one at 10% mastery.

Upon implementation of the intervention phase, the *materials* intervention showed an immediate and upward change in level (from 0-10% to 70% correct responses) over baseline. Criteria were met first for the *materials* intervention. The *model* intervention also showed an immediate and positive change in level over baseline. The data for the *model* intervention showed approximately the same pattern of responding as the *materials* intervention, however, percent of mastery lagged behind the *materials* intervention. Probes for the control task were at 95% and 80%. Both visual supports were visible during the implementation of the control. Even though there was no prompting by the staff to use an intervention, Subject A immediately saw the visual supports on a table in the room and walked over to get the visual showing *materials*. He began using the *materials* intervention with the control task, unprompted and without teaching from a staff member. Even though Subject A used a visual support, he was unable to meet criteria on the control task.

During the probe phase, Subject A immediately reached criteria using the *model* intervention with the *setting the table* task. A probe of the *materials* intervention reflected 100% mastery. The probe of the control task was 80%. Subject A continued using the *materials* visual support with the control task, but the visual was not prompted or taught by the staff.

During the best alone phase, the more efficient intervention, *materials*, was implemented with the control task. Subject A's performance immediately increased to 97% mastery level at the first data point. Subsequent data points yielded scores at 100%, therefore reaching criteria during the fourth session of the best alone phase using the more effective *materials* intervention

with the control task. Subject A's maintenance performance using the *materials* intervention was at 100%, 95%, 100%; and, for the *model* intervention, it was 100% and 100%.

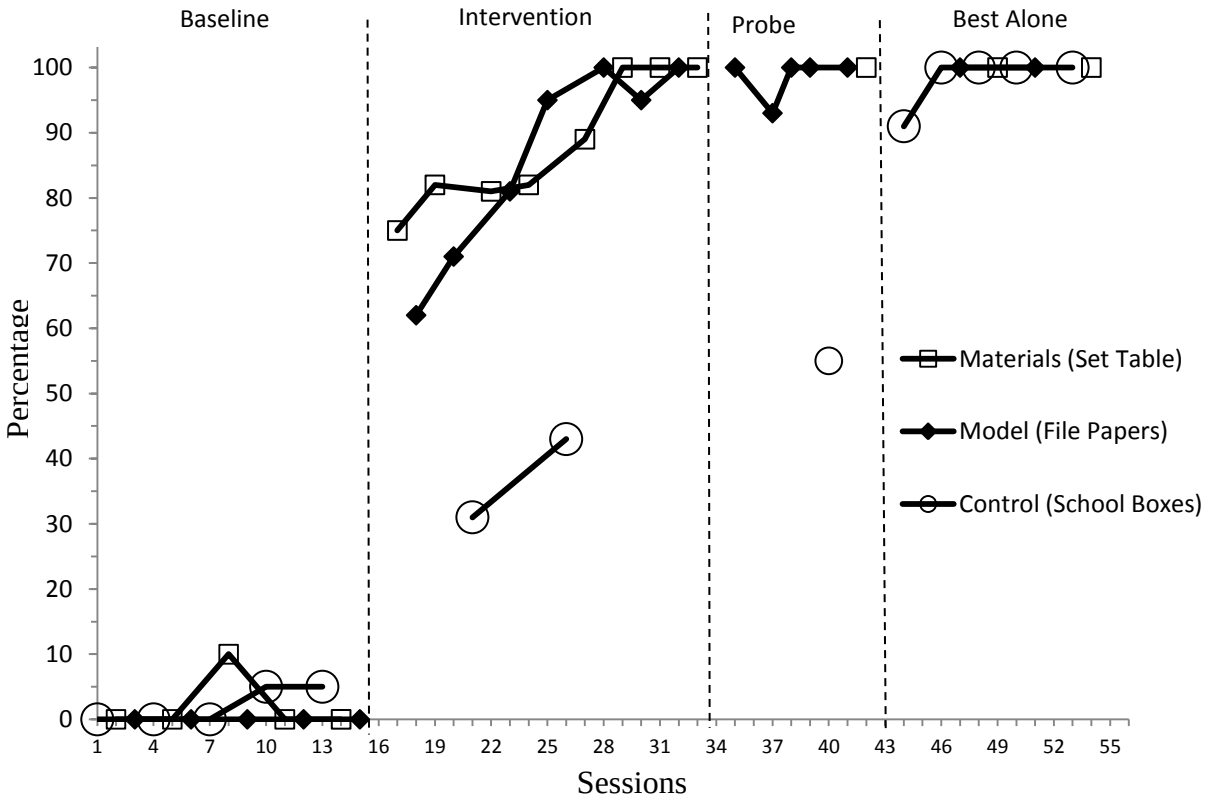
Subject J

Figure 5 contains the graphed data for the percentage of mastery of trial steps for Subject J. The random assignment of tasks to intervention/control was as follows:

- Intervention 1 (Materials): Setting the Table
- Intervention 2 (Model): Filing Papers
- Control Task : Making School Boxes

Figure 5

Percentage of Mastery of Trial Steps for Subject J



During baseline phase, Subject J's performance took place without implementing interventions. Both sets of visual supports were within the vicinity of the work area but were not taught during this phase. The subject was provided with verbal reinforcement non-contingent upon performance across all four phases of the study. Data for *materials* intervention task yielded a 0% mastery level on four of five data points with one data point at 10%. Performance for the *model* intervention task remained at 0% during the baseline phase. Data for the control task, *making school boxes,* yielded three data points at 0% and two at 5%.

Upon implementation of the intervention phase, there was an immediate change in level from 0 - 10% to 75% over the baseline data. Subject J met criteria first using the *materials* intervention. Using the *model* intervention, Subject J's performance reflected an immediate change over baseline from 0 to 60%. Using the *model* intervention the results yielded two nonconsecutive data points at 100%, but criteria of three consecutive data points were not reached. Probe of the control task yielded two data points 31% and 43%.

During the probe phase, Subject J's performance using the more efficient *materials* intervention remained at 100%. Subject J reached criteria using the *modeling* intervention on the fifth data point, with data points at 100%, 93%, 100%, 100%, and100%. The probe of the control task reflected a percentage of 55%.

During the best alone phase, the more efficient intervention (*materials*) was implemented with the control task, *making school boxes,* and immediately reached 100% level on the second session of the phase and met criteria on the fourth session. Subject J's maintenance data on both the *materials* and *model* interventions, continued at a mastery level of 100%.

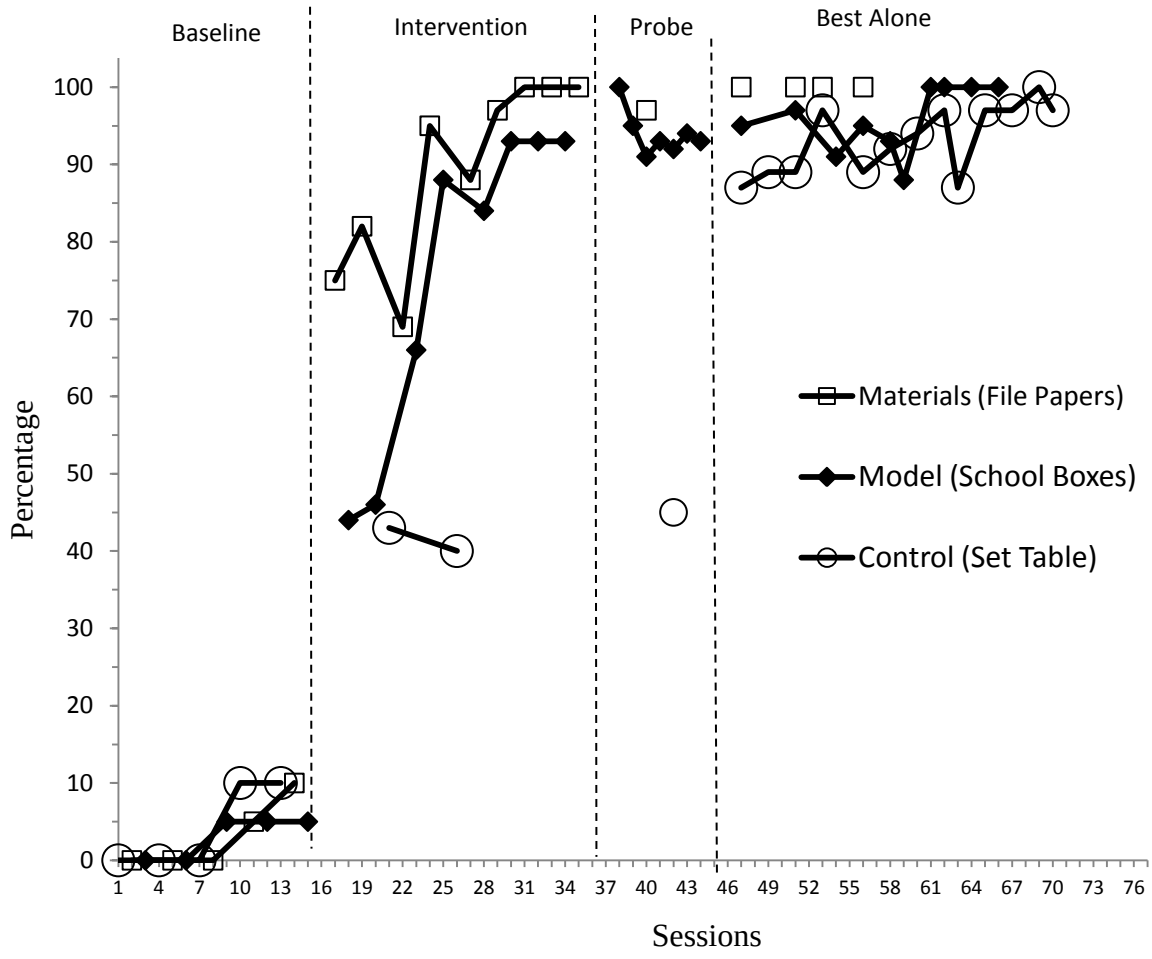
Subject T

Figure 6 shows the data for Subject T's performance. The random assignment of tasks to intervention/control for Subject T is as follows:

- Intervention 1 (Materials): Filing Papers
- Intervention 2 (Model): Making School Boxes
- Control Task: Setting Table

Figure 6

Percentage of Mastery of Trial Steps for Subject T



During the baseline phase, Subject T's performance took place without implementing interventions. Both types of visual supports were present and in the area but were not taught. The subject was provided with verbal reinforcement non-contingent upon performance. Data for the *materials* intervention reflected three of the five data points at 0% and two at 5%. Data for the *model* intervention reflected 0% on three of the five data points with data point four at 5% and data point five at 10%. Data for the control task, *setting the table*, reflected three of the five data points at 0% and two at 10%.

During the intervention phase, the subject's performance using the *materials* intervention made an immediate increase from 10% to 75% over the baseline phase. The subject reached criteria first using *materials*. The subject's performance using the *model* intervention also reflected an immediate increase in performance as compared to baseline and from 5% to 45%. Three of the eight data points reached 95% consecutively at data points six, seven and eight. The two types of intervention remained in view during the subject's completion of the control task. Data on the control task reflected percentages of 43% and 40%.

During the probe phase, Subject T's performance using the *materials* intervention made a slight decrease to 97%. Performance on the *model* intervention still did not meet criteria with several data points ranging from 90% to 100%. Performance on the probe of the control task yielded a data point of 45%.

During the best alone phase, the more efficient intervention, *materials*, was used for the control task. There was an initial increase over the probe phase, from 45% to 87%. During the 13 sessions, Subject T had one data point of 100% at session 12. Five of the 13 data points reached a mastery level of 97%. Even with the sessions extended until the last day of school, Subject T did not reach criteria using the more efficient intervention with the control task during this phase.

Using the *model* intervention, Subject T's data ranged from 95% to 88% before reaching criteria on session nine. Maintenance data indicates that subject T was able to maintain 100% mastery using the more efficient *materials* intervention.

Sessions to Criteria

The second format used to measure the efficiency of interventions was by comparing the performance of subjects through the analysis of *sessions to criteria* data. The results are depicted in Tables 19, 20 and 21.

To calculate *sessions to criteria* data, I counted the number of sessions from the intervention phase to point at which the subject reached criteria. Additional data for s*essions to criteria* was gathered for the best alone phase. This data were calculated by counting the number of sessions that were required of the subject to reach criteria on the control task after the more efficient intervention was implemented.

Subject A

Table 19 shows *sessions to criteria* data for subject A.

Table 19

Number of Sessions Required to Reach Criterion for Subject A

Subject A	
Intervention	**Sessions to Criteria**
Materials (School Boxes)	10
Model (Set Table)	12
Best Alone * (File Papers)	4
Criterion is defined as three consecutive data points at 100% **Begin counting at implementation of Best Alone phase*	

The number of sessions required for Subject A to meet criteria using the visual support showing photos of the *materials only* with the *school box* task was 10. Using the visual support showing a *photographic model* of the step being completed required 12 sessions. The data indicates that the *materials* intervention was more efficient by two sessions. When the more efficient intervention (*materials*) was used with the control task (*filing papers*), Subject A required only four sessions to meet criteria. This criterion was reached in six fewer sessions than the first time it was implemented with the *school boxes*.

Subject J

Table 20 shows *sessions to criteria* data for Subject J.

Table 20

Number of Sessions Required to Reach Criterion for Subject J

Subject J	
Intervention	**Sessions to Criteria**
Materials (Set Table)	8
Model (File Papers)	12
Best Alone * (School Boxes)	4
Criterion is defined as three consecutive data points at 100% **Begin counting at implementation of Best Alone phase*	

The number of sessions required for Subject J to meet criteria using the visual support containing photos of the *materials only* with the *setting table* task was only eight sessions. When the *model* intervention was used, it required four more sessions for a total of 12 in order to meet criteria. When the more efficient intervention, *materials*, was implemented with the control task (*making school boxes*), Subject J required only four sessions to meet criteria as compared to the eight sessions required to meet criteria during the initial *materials* intervention.

Subject T

Table 21 shows the *sessions to criteria* for Subject T.

Table 21

Number of Sessions Required to Reach Criteria for Subject T

Subject T	
Intervention	**Sessions to Criteria**
Materials (File Papers)	9
Model (School Boxes)	24
Best Alone* (Set Table)	Did not reach criterion
Criterion is defined as three consecutive data points at 100% **Begin counting at implementation of Best Alone phase*	

The number of sessions required for Subject T to meet criteria using the *materials* intervention was nine sessions. Using the *model* intervention, Subject T took 11 additional sessions to reach criteria for a total of 24 sessions as compared to nine sessions using *materials* intervention. When the more efficient intervention (*materials*) was used with the control task (*setting table*), Subject T's performance reached 100% mastery on one session but never met criteria by performing at 100% over three consecutive sessions.

Percentage of Non-Overlapping Data Points

In order to determine the strength of the two interventions, a percentage of non-overlapping data points (PND) was calculated for data from the intervention phase. I compared the first data point of the *materials* intervention to the first data point of the *model* intervention along with each of the control task data points to the closest point of intervention. A percentage (Table 22) was derived for comparison purposes and is important in helping to determine if one intervention is consistently superior to another (Gast, 2010).

Table 22

Percentage of Non-overlapping Data Points

Subject	Between Intervention I (Materials) and Intervention II (Model)	Between Control Task and Intervention I (Materials)	Between Control Task and Intervention II (Model)
A	67%	100%	50%
J	43%	100%	100%
T	100%	100%	100%

The results indicate that for Subject A, the *materials* intervention was superior to the *model* intervention on six of nine sessions, yielding a percentage of 67%. Subject J's results indicate that the *materials intervention* was superior to the *model intervention* on three of seven sessions, which calculates to a percentage of 43%. Subject T's results indicated that *materials* was superior to *model* on eight out of eight sessions and yielded a percentage of 100%.

The differences between the control task and Intervention I (*materials)* was consistently at 100% for all three subjects indicating no overlaps. These data are to be used with caution as there are only two control data points available for comparison purposes for each subject. These data indicated that Intervention I was consistently superior to the control across all three subjects and different tasks. The PND comparing the difference between the control task and intervention II (model) across the three subjects was not consistent. Subject A's data yielded a 50% PND indicating that the intervention was superior to the control task for only half of the data points. Subject A chose to use the *materials* intervention to complete the control task. Subject J and Subject T's PND between control and Intervention II were both at 100%.

Reliability and Validity Data

In addition to reporting the results from the *Staff Training Evaluation*, the reliability of the study was determined by gathering data in both procedural fidelity (PF) and inter-observer agreement (IOA).

Staff Training Evaluation

The *Staff Training Evaluation Questionnaire* was used to determine staff perceptions of the training they received prior to implementation of the study. The staff provided positive "yes" responses for all statements, which indicated they felt the training provided the information needed to participate; I respected the participant's time; the information was easy to understand; the training was structured and organized; and the trainer answered all questions and provided follow-up when needed.

Procedural Fidelity

In order to verify procedural fidelity, a percentage level standard of 90% was used to indicate an acceptable level of PF. I completed procedural fidelity checklists for 100% of the sessions of the baseline phase and 30% of all other sessions. I calculated the PF by dividing the total by the number of steps completed correctly by the total number of steps. During the baseline phase, procedural fidelity results showed the teacher met the 90% standard by correctly following the steps to the study with 98% accuracy. The assessment of other sessions yielded a percentage of 95% accuracy, which also exceeded the acceptable level standard of 90%.

Inter-observer Agreement Data

Inter-observer agreement (IOA) data was derived by dividing the number of agreements on specific data points by the total number of selected data points, then multiplying the difference by 100. The standard that signified an acceptable level of IOA was 90% or above. The

paraprofessional served as the primary data collector of subject performance data in the study, while the teacher implemented the sessions with the subject and also collected data. I independently collected subject performance data for 100% of the sessions during the baseline phase and 20% of sessions during each of the remaining three phases, intervention, probe and best alone. A neutral observer also collected subject performance data for a total of four randomly chosen sessions across the intervention, probe and best alone phases.

Inter-observer agreement between the teacher and I was 94% for each phase, indicating an acceptable level of agreement across all phases of the study. The IOA results from the neutral observer data yielded a 95% level of agreement across the four random sessions throughout the study. This also indicates an acceptable amount of agreement in the data collection process.

Social Validity Data

At the conclusion of the study, I gathered data related to social validity (SV) to determine the perceptions of the teacher and paraprofessional involved in the study. Data were taken on the staff member's perception of the results or outcomes of the research study.

The mean scores and a range of scores of each question were listed for each subject on Table 23. The mean score for each question was calculated by each staff member (Mrs. S. and Mr. J) by combining their ratings for all subjects and dividing by the number of subjects. The range of scores was calculated for each of the five survey questions by reviewing all surveys completed by the specific participants.

Table 23

Social Validity Survey: Mean Score and Range by Questions

	Mrs. S		Mr. J		Total
Questions	Mean	Range	Mean	Range	Mean Response
1	5	5	5	5	5
2	5	5	5	5	5
3	5	5	5	5	5
4	5	5	5	5	5
5	5	5	5	5	5

1= Strongly Disagree; 2= Disagree; 3= Neutral; 4 = Agree; 5= Strongly Agree

There were a total of six surveys completed. Each of the two staff participants completed one survey for each of the three subjects who participated in the study. The response options for the five questions ranged from 1 for *Strongly Disagree* to 5 for *Strongly Agree*. The mean score for each question across all three subjects was calculated to be consistently *five*. In reviewing the surveys, the response to all of the questions on all six surveys was *five*, so the range was also *five*. Total mean response across all surveys was *five*.

CHAPTER 5

DISCUSSION

Chapters 1 through 4 provided the reader with a background and research foundation upon which the study was based, specific procedural steps followed during the study and the results presented in a numerical format. Chapter 5 now provides the reader with a narrative synopsis and discussion of the results as outlined by the initial research questions. Also discussed in this chapter is the comparison of results to literature findings, clinical impact, and limitations and implications for further research.

Research Questions

In discussing the results of the study I will answer the research questions and discuss the data in several different ways. Among these are variations in the data among the subjects; comparison of the results to previous research; clinical impact; limitations and areas of further research.

The following were the overarching questions that helped guide me in the design, implementation and analysis of the results of this study. The information provided as the answers to these questions will help guide the discussion of results.

1. *How large were the differences in the efficiency of the two types of visual supports in assisting subjects to independently complete the sequential steps of a task and reach set criterion?*

According to the data, there appears to be a slight difference in the efficiency between the two types of visual supports as indicated by the *materials* visual support meeting criteria prior to

the *model* visual support. Even though there was only a slight advantage, each subject, regardless of the task he used, reached criteria first using the *materials* intervention.

2. *What was the most efficient type of visual support in the acquisition of independent work skills on multi-step tasks?*

The most efficient type of visual support, according to the current research study's data, appeared to be the one using photographic images of only the *materials* used for the completion of each step of the task. There was a large and immediate change from the baseline to intervention phase in all three subjects and across all tasks. All three subjects were able to maintain acquisition and mastery of the skill regardless of the task used across several subsequent sessions.

3. *Could the most efficient visual support be generalized to other types of tasks?*

The most efficient visual support was used with the control task during the best alone phase of the study. Two of the three subjects were able to generalize the efficiency of the intervention by immediately meeting criteria using the control task. One of the subjects did not meet criteria in the time allowed for the research study. Extenuating circumstances such as school year coming to an end, limited the study from continuing the sessions. I was not able to determine if the subject would have been able to meet criteria in extended sessions.

Discussion of Subject Performance

The discussion of subject performance will be presented in the following section outlined by each of the three subjects.

Subject A

Through a visual analysis of the results from Subject A's performance during the baseline phase of the study, it appears that he showed little to no ability to complete the tasks without the

use of visual supports. Subject A became frustrated and impatient, giving up quickly, during the administration of the tasks during baseline. As the study moved into the use of interventions, the demeanor of the subject dramatically improved. He did not give up during the completion of the tasks while using the visual supports as he did when the visuals were not present. He appeared to use the visual supports to problem solve, patiently looking at the photos to determine the next step of the task.

During the intervention phase, the subject was taught using two different types of intervention visuals. He quickly met criteria using the *materials* intervention. Even though neither of the two intervention visuals was presented to the subject for use with control task both were in sight in the vicinity of the work area. It is interesting to note that the subject immediately saw the visual supports, went to the desk and picked up the one containing photographs of the *materials* only. The subject had had two prior sessions of instruction using each of the interventions prior to being presented with the control task. He appeared to have learned that the visual supports would assist him in making the completion of the task easier so he spontaneously made the decision to use the *materials* intervention with the control task. Subject A used this visual, without instruction from the teacher and made some improvement over this performance during baseline.

During the intervention phase, Subject A seemed to enjoy the tasks and was attentive during the entirety of the sessions. Being low verbal and not speaking unless strongly prompted, he quietly used the intervention visuals to perform the tasks. This was in contrast to his behavior during baseline when no interventions were used.

During the best alone/maintenance phase, Subject A almost immediately met criteria using the most efficient *materials* intervention with the control task. Because teaching was now

used with this intervention and Subject A moved quickly to reach criteria. Even though he used the intervention during the intervention and probe phase, he was not using it well enough to be independent. Generalization data indicated that Subject A demonstrated the ability to not only generalize the skills needed to use the *materials* intervention on an additional task, he also maintained mastery reached earlier, throughout the entire research study. Subject A's data was interesting in that he independently made the choice to use the *materials* intervention over the *model* intervention with the control task during the intervention phase. He appeared both competent and comfortable with using the support.

Subject J

A visual analysis of the data indicates that Subject J was unable to complete the tasks during the baseline phase without the use of visual supports. He was patient with the process and tried to complete each task but was unable to do so.

During observation of the intervention phase, Subject J quickly met criteria using the *materials* intervention. It appeared that he became highly distracted by several of the details in the *model* intervention. Several times the subject noticed that he was wearing a different color shirt than was in the photo. At one point he went over to get his jacket and put it on because he had one on in the photo. The subject also noticed the placement of objects and people in the background of the photo and would try to place the objects in the same place as was in the photo. He became fixated on recreating the exact environment prior to the completion of the task. It is interesting to note that when Subject J used the *materials* intervention, he remained more focused and did not appear to be as distracted as with the *model* intervention. The fact that the *materials* photographs did not contain photos of a person appeared to make it easier for him to use.

During the intervention phase, there was an initial increase in Subject J's ability to complete the control task as compared to the baseline phase. Unlike, Subject A, Subject J did not use either of the visuals for this task. Even without the use of the intervention visuals, Subject J still had a slight increase in his ability to perform the task. This task was probed after beginning the interventions with the other two tasks, and it appeared as if Subject J began to generalize the structure of the other tasks and applied that structure to the control task (making *school box kits*). He appeared to look in the crate to see the type of materials and began appeared to use trial and error to problem solve, applying what was learned in the completion of the other two crated tasks (*filing papers* and *setting table*). Even with though there was a slight increase in performance on the control task, he was not able to reach criteria without the intervention visuals.

During the probe phase, Subject J was able to maintain a mastery level in what he had learned to do using the *materials* intervention. He also quickly met criteria using the *model* intervention, even though aspects of the photographic images appeared to be distracting to him.

The best alone phase indicated that Subject J had the ability to maintain mastered skills. Upon implementation of the most efficient intervention with the control task, he also quickly achieved the criteria indicating mastery and was able to maintain that level until the end of the study. Generalization occurred as indicated by the subject demonstrating the ability to quickly reach criteria on the control task using the more efficient intervention. He appeared comfortably independent in his use of the visual supports

Subject T

During baseline, Subject T showed a great deal of patience in trying to figure out what to do with the materials to each of the tasks. When given the initial directive to begin the task, he would stand looking at the crate of materials appearing as if he did not know where to begin. He

was patient in his attempt but did not demonstrate the ability to complete any of the tasks without the use of intervention visuals.

During the intervention phase, Subject T's performance using the *materials* intervention made the largest change from baseline. He quickly appeared to grasp the concept of using the intervention and made steady progress toward mastery until criteria was met. The less efficient intervention did not meet criteria but did make progress toward mastery. In observing the subject complete the task using the *model* intervention, it appeared as if he struggled. It was difficult to determine if the subject struggled with becoming distracted at all of the details of the *model* photo making it difficult to concentrate on the necessary stimulus or if he was unable to see the details of what was required from the photo. It appeared as if there was too much in the photo for the subject to glean what was important for him to attend to. The complexity of the *model* photo appeared much more difficult to use than the more simplistic *materials* photo.

There also appeared to be an immediate change in the subject's initial ability to complete the control task. Subject T had both intervention tasks presented to him prior to the use of the control task during the intervention phase and it appeared as if he may have been generalizing the structure of the intervention task to the control task so that he began to understand what was required of him. He no longer stood and stared at the materials in the crate but actually pulled them from the crate and began to try and figure out how to complete the task even without the use of a visual support. Even though there was an initial and sustained change in the subject's ability to complete the control task, his performance remained at a consistent low level and did not move toward mastery.

During the probe phase, the control task continued to be probed with no increase in ability to master the task. The most efficient intervention was probed and Subject T was able to

complete the task but decreased slightly in his performance. He was still not able to meet criteria using the *model* intervention during this phase. He continued to struggle with using the intervention visual, holding it close to his face, and staring at it for a lengthy amount of time prior to completing each step. He was quiet and never complained or said anything but was patient in his completion of each step.

During the best alone phase, the subject was able to maintain mastery using the most efficient intervention (*materials*). In observing his performance, he appeared to have an easy time, actually enjoying the completion of the task using the *materials* visual support. Subject T also continued the use of the less efficient *model* intervention, striving to meet criteria. He was finally able to meet criteria after several sessions. It almost appeared as if his success may have been more due to trial and error than the actual use of the *model* intervention.

Using the control task with the *materials* intervention, Subject T did not meet criteria prior to the end of the study. The end of the study occurred at the last day of school and no extended sessions were available. In reviewing the data, there was a slow progression toward mastery, but criterion was not met. Subject T was able to perform at 100% level on one session toward the end of the study, but the criteria of three consecutive sessions at 100% were not met. The task involved the manipulation of several items involved in *setting a table* and the utensils had to be set in place with the handles pointed downward. Subject T struggled with the exact placement of these items and made errors by placing them in the correct place but upside down. The errors were consistent across almost all demonstrations of the task. In examining the photographic visual model, it may have been difficult for him to see the details needed for correct placement of these objects. If the schedule had allowed several more sessions, Subject T may have met criteria.

Social Validity Data

Social validity data were derived through a completion of *Social Validity Surveys* by the two staff members. Staff perceptions of the effectiveness of the overall research study and of the effectiveness of the interventions were measured. All responses were *five,* which is the strongest response option on the Likert scale.

The teacher and the paraprofessional used visual supports in the classroom on a daily basis. Both staff members felt that visual supports made a significant difference in the acquisition of skills and in the day to day independent adherence to a schedule. The subject's schedules in the classroom were supported with the use of visuals as were the work tasks. Regardless of the type of visual intervention used, the staff fully supported its use and felt strongly that this research study was a success.

On an informal basis, the staff members verbally indicated that the subjects enjoyed completing all of the tasks and appeared to make a great deal of progress in their ability to independently complete tasks. The teacher reported that she would see that the subjects continue using both the tasks and the interventions within the classroom even after the completion of the study. She also reported that the intervention would be used with other types of tasks in the classroom.

It is noted that I serve as the principal for the center and directly supervised the staff participants. Even though the staff was given the option of completing the surveys anonymously, they did not. I am also aware that because of the supervisory role of the researcher to the staff members, the responses on the *Social Validity Survey* may have been inflated.

Comparison of Results to Literature Findings

Theoretical assumptions of the study, based on a review of the literature, supported the use of visual supports with students on the autism spectrum (Quill, 1995, 1997; Savner & Myles,

2007; Boswell & Nugent, 2002; Schopler and Mesibov, 1994; Yoder & Stone, 2006; and Pries, 2006). From the use of black lined drawings (Wacker &Berg, 1983), to full color symbolic representation of an object or activity (Bondy & Frost, 2001) to the use of photographic visuals (MacDuff, Krantz, and McClannahan, 1993; Schmit, Alper, Raschke, & Ryndak, 2000; and O'Reilly, Sigafoos, Lancioni, Edrisinha, Andrews, 2005) to the current utilization of technology in the creation of video supports (Nikopoulos & Keenan, 2003; Cihak, Alberto, Taber-Doughty, & Gama, 2006; and Hammond, Whatley, Ayres, & Gast, 2010), the use of visual supports in the classroom is one of the most accepted forms of interventions used for students on the spectrum. The need for all of these supports to assist subjects in the mastery of tasks to an independent level was also cited (Bryan & Gast, 2000; Hume, Loftin, & Lantz, 2009, Hall, McClannahan & Krantz, 1995; Mechling & Gast, 1997; as cited in Bryan & Gast, 2000).

There were several key studies related to my research. MacDuff, Drantz, and McClannahan's (1993) work found that the use of static photographic visual schedules were effective in decreasing the need for adult prompting. The research by Schmit, Alper, Raschke & Syndak (2000) indicated a reduction in significant behaviors using a static photographic visual cueing system. In 2006, Cihak, Alberto, Taber-Doughty, and Gama's research found there to be positive results with little difference between the use of static photographic visual supports using a model of each step to a task and the use of a video model of the steps of a task. Hammond, Whatley, Ayres, & Gast's research in 2010 yielded positive results in the use of video-modeling with intellectually disabled students and learning to use an *iPod Touch*®. The research by Cihak, Wright and Ayres (2010) showed there to be a positive effect in the use of static self-modeling photographs on the ability of students with autism to self-monitor and increase their attention and engagement in the classroom.

Through a review of the literature, a gap was noted in research studies. The gap was in the lack of comparative studies using two types of static photographic visual supports: one photo using a subject *modeling* the required behavior for a step to a task and the other photo depicting the *materials* used in the completed step of the task. My current study was designed to add supportive research to bridge the gap. The early studies were designed to determine the effectiveness of visual supports in general and the later studies were designed to compare the effectiveness of static photographic visual supports to technologically advanced video supports. The gap in the research is a comparative study between two types of static photographic visual supports: one showing *materials* and one *modeling* the steps to the task.

Clinical Impact

In this section the results of the study are discussed as to the clinical impact in two areas. The results impact not only researchers in the field of special education but also teachers in the classroom directing the education of students with autism. This will help organize the results as to the current impact and also frame the results for areas of future research

Impact on Special Education Researchers

There were several ways in which the results could impact special education research. The first and most important is that the results indicate the most efficient intervention to be the *materials* not the *model* intervention. This seems to be diametrically opposed to the current move toward the use of the modeling visuals in today's classrooms. Continued research in this area is recommended to further validate the results.

Another way the results impact special education researchers is the noticeable difference in the ease at which the subjects performed. When I began implementing the interventions, each of the subject's body language seemed to indicate a more relaxed demeanor. The latency in the subject's beginning the task appeared to be shorter and they appeared to perform the task in a

more fluid manner, moving from one step to the next without much hesitation. In addition, the subjects appeared to enjoy completing the tasks, requesting the teacher allow them to do the tasks at other times during the day. This contrasts to the demeanor and lack of interest shown during the pre-intervention baseline phase when Subject J audibly protested having to do the tasks. The clinical impact for researchers would be that even though the data did not indicate a strong advantage in using the *materials* visual over the *model* visual, there was a difference in meeting criteria. In addition to the difference in efficiency there also appeared to be a difference in the ease and demeanor of the subjects when using the interventions. The subject's nonverbal and verbal cues appeared to show the positive impact of using interventions over using no interventions with the tasks. Results from additional studies examining the impact of using visual supports on the behavior and stress level of subjects with autism would be interesting.

The results also provide for an additional area of clinical impact on special education intervention research. Due to the distraction of extraneous stimuli within the modeling visual for two of the subjects, it may have been helpful for the photographs to have been taken of other students rather than of the subject himself. The distracting aspect of looking at photos depicting the subject wearing a certain color shirt or the placement of a person or object in the background may be a strong distraction for students on the spectrum. If one is to create a visual support showing a *model* of the step that takes into account this issue, the visuals would need to depict the subjects wearing different colored shirts for each photo or using subjects other than the ones in the study. This may help alleviate the fixation on the unimportant stimuli within the photos. The photos could also be taken in either a sterile environment with nothing in the background or in the classroom, paying careful attention to background objects. Further research and replication of studies will be necessary to determine the effect.

Impact on Special Education Teachers

One of the primary ways in which the results impact special education teachers is in resources required for the creation of the interventions themselves. If I, as the researcher or a teacher, were to consider the ease of creating the two types of intervention visuals in the classroom in order to make a choice of which intervention to implement, the choice would be to use the one with *materials* only. The creation of a visual support that involves photographing a low functioning student with autism *modeling* the steps of a task is difficult. It took a great deal of time to pose each of the subjects using the materials to perform each step, to take the photographs and then to review the photographs to see that each element of the steps were clearly visible. Due to the subject's lack of patience and inattentiveness in addition to the difficulty with obtaining a clear picture of the step to the task, the photos had to be recreated several times. From a teacher's viewpoint, the creation of visual supports that use materials only would require less time to create than those that involve photographs of subject models. In addition to the slight advantage the *materials* intervention had over the *model* intervention in this research study, this further supports its use in the classroom.

Limitations and Implications for Further Research

When analyzing and interpreting the results of a research study, it is important to consider all limiting factors. It is also important to consider the limitations when designing future studies. There were several limitations of the current study I took into account through the process of data analysis. These were as follows:

- Sample size
- Age and functioning level of subjects
- Presence of visual disability
- Nature of the tasks
- Control

The first limitation focuses on sample size and the difficulty with generalizing the results of the study to a larger population. The low *sample size* and the variability of cognitive, social, and communicative skills all dramatically impact my ability to generalize the findings to a larger population. Replication of the study is recommended (Lonigan, Elbert, & Johnson, 1998) in order to further validate the results of the study. Replication of the study would require the use of subjects with the same type of profile and those with a different type of profile. It would also require the use of more complex tasks using the same type of subject sample and a different type of subject sample.

The second limitation is a continuation of the variability of subjects and focuses on the *age and functioning* of the participants. All of the subjects were diagnosed as having autism and were functioning in the moderate intellectually disabled range displaying stereotypical behaviors. A comparison to a higher functioning population will be difficult as the intellectual functioning of the subjects affects the rate of skill acquisition and the flexibility of using different types of interventions without the interference of rigidity. This rigidity was noticeable in the fixation of Subject J on the details of the *modeling* intervention photographs. Subjects from a sample of higher functioning students with autism may or may not have this fixation and may have an easier time using the *modeling* intervention.

The current study was completed using subjects who were functioning with a moderate level of intellectual ability. These decreased cognitive skills may have impacted their ability to use the *model* intervention. Further research, addressing the limitation of *sample size, age and functioning levels*, should be considered in replicating the study with a higher functioning sample. Future studies are recommended to determine if there is a difference in the efficiency between the two types of interventions when used with students with autism who are functioning at a mild level of intellectual functioning or above. Students who have Asperger's syndrome would be an appropriate population for future studies in the effectiveness of the visuals. It will also be important to consider the visual acuity of participants to address the limitation in this study.

The third limitation is concerning the documented *visual difference* in Subject T's ability that was discussed in Chapter 3, when detailed information was provided about each of the participating subjects. Accommodations and modifications of the materials, consistent with what was used in the classroom and recommended by vision specialists, were made so as to enhance the comparability of subject profiles. Even though the photographic visual supports were increased in size to 4 by 6 inches for all three subjects, this still may not have been adequate for Subject T to fully differentiate small details contained in the *modeling* photos. This limitation may have impacted his ability to meet criteria comparable to the other subjects.

The fourth limitation was the *nature of the tasks* in general. Each of the tasks was designed paying careful attention the number of steps involved, the number of manipulatives required, the type of physical movement required for each step, and the complexity of each step. The subject's ability to complete the tasks was pre-assessed prior to the implementation of the study. In observing the completion of the tasks throughout the study, it is noted that the tasks

may have been too similar in their structure. The repetitive nature of all three tasks may have had a carryover effect with the subjects from one task to another. In future studies, this will need to be accounted for prior to the design of the study. This similarity in tasks may be the reason the control task showed greater mastery when probed during the intervention and probe phases.

The fifth was concerning the *control.* The fact that Subject A used one of the interventions to complete the control task was interesting but created a scenario that made it difficult to compare control for that Subject. It is also interesting to note that Subject J's ability to complete the control task during the Intervention phase increased from baseline indicating the possibility that there could have been inference from other tasks.

There should also be careful consideration of the specific *nature of each task* that is included in future studies. The tasks should be carefully screened as to the specific skills needed to complete each task. Comparable tasks that are not repetitive will be important to include in future studies. In implementing future studies, it will also be important to monitor the research design and the analysis techniques that are chosen so that issues with the *control task* and *determination of differences* can be addressed.

Notwithstanding the importance of the current research study, replication of the research study is important as is future research using comparative studies between types of visual supports. Future questions to be answered through further research could be:

- Is there a comparative difference in the efficiency of the *materials* intervention and the *model* intervention when used with higher functioning subjects on the autism spectrum, including those with Asperger's syndrome?

- Is there a comparative difference in the efficiency of the *materials* intervention and the *model* intervention when used with a younger age level of subjects on the autism spectrum at all levels of functioning?
- Is there a difference between the effectiveness and efficiency of a photographic visual model and a fluid video model in teaching students a novel task?

In the replication of this study and in future related studies, it will be important to determine if both maintenance and generalization occurs. It will also be important to frame future studies to determine the reasons why the *modeling* intervention was not the most efficient in the current study. Consider the following:

- Was it the age of the subject?
- Was it the cognitive functioning level of the subject?
- Was it the type of task involved?
- Was it the background of the photographs?
- Was it due to the photographs being those using the subject modeling?

These questions will be important ones to remember in framing future research.

Despite the limiting factors inherent in a single subject research design and in the current study, there are also several implications that can be derived for further research. In my viewpoint, this study provides continued support for the use of visual supports in teaching students with autism to complete multi-step tasks independently. There are an ample amount of research studies on the effectiveness of visual supports used to elicit communication and independent functioning in students with autism (Quill, 1995; Quill, 1997; Pries, 2006; Mirenda, 2003; MacDuff, Krantz, & McClannahan, 1993; McClannahan, & Krantz, 1999). The differentiating factor in this research study is that it was designed to compare the efficiency of

two types of visual supports. One of these visual supports included the use of a photographic *model,* which can be considered a pre-cursory activity to the use of video-modeling.

Conclusion

The results from this study were consistent in showing that, with subjects on the autism spectrum, visual supports showing only the *materials* used to complete a task were more efficient than visual supports showing the *subjects* modeling the completed steps of the task in the classroom. All subjects made a significant increase in their ability from baseline to intervention. This increase in the ability to independently complete multi-step task appeared to be directly related to the use of the visual supports with the most efficient being the one using only *materials*. The results went against my hypothesis that the interventions using *modeling* photographs would have been the most effective.

Even though replication will be needed to further support the results, teachers will appreciate that they will be able to do less preparatory work and still get good results. Even if the interventions had been equally efficient or if the photographs of the model had been slightly more efficient, when determining which intervention to use in their classroom, teachers consider the time it takes to prepare for lessons. Having been in the classroom myself, if I had to choose between spending multiple hours in the creation of my visual supports versus spending a single hour, I would certainly chose the one that required less time. My time as a teacher is valuable, and if I can spend less time on an intervention and continue to have the same level or even more efficient results with my students, I will certainly choose to use that intervention.

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Appendix A
Informed Consent Form

My signature below indicates that I have read the information provided and have decided to allow my child to participate in the study titled ***"A Comparative Study: The Use of Two Types of Photographic Visual Supports in the Independent Completion of Work Tasks by Subjects on the Autism Spectrum"*** to be conducted at my child's school between the dates of March 15th, 2011 and December 31st, 2011. I understand that the signature of the researcher and classroom teacher indicates they have agreed to participate in this research project.

I understand the purpose of the research project will be to compare the effectiveness of two types of visual supports in the independent completion of work tasks in the classroom setting. My child will participate in the following manner:

1. Be photographed so that the photographs can be used on his visual activity schedule.
2. Use the visual activity schedule to learn to complete work tasks independently in the classroom. Tasks include:

- *Setting the table*
- *Filing and sorting papers*
- *Making school box kits*

Potential benefits of the study are:

- *Increase independence on work tasks*
- *Enhance understanding of the use of visual supports in the classroom*
- *If the technique proves beneficial, the technique may be used in other settings or even at home to enhance understanding and independence.*

I agree to the following conditions with the understanding that I can withdraw my child from the study at any time should I choose to discontinue participation.

- The identity of participants will be protected. Names of participants will be pseudo names and their identities will be kept confidential. The name of the school, classroom staff and school system will also be confidential and pseudo names will be used. Photos will only be used in the creating of the student's activity schedule.

- Information gathered during the course of the project will become part of the data analysis and may contribute to published research reports and presentations.

- There are no foreseeable inconveniences or risks involved to my child participating in the study.

- Participation in the study is voluntary and will not affect either student grades or placement decisions (or if staff is involved-will not affect employment status or annual evaluations.)

If I decide to withdraw permission after the study begins, I will notify the school of my decision. If further information is needed regarding the research study, I can contact:

Cindy Golden @ 706-253-1790 or ***cindygolden@pickens.k12.ga.us***

Signature _____
Parent Date

Signature_____
Researcher Date

Signature_____
Classroom Teacher Date

Appendix B

Evaluation of Staff Training

Name _____ ☐ Teacher ☐ Paraprofessional
(name not required)

Date _____

		Yes	No	Somewhat
1.	The training provided me with the information/materials I needed in order to participate in this study.			
2.	The trainer respected my schedule and presented the material in a manner that made the best use of time.			
3.	The information provided was presented in a manner that was easy to understand.			
4.	The training provided the material in a structured and organized manner.			
5.	The trainer patiently answered all of my questions and offered follow-up sessions if they are needed.			

Additional Comments and/or Suggestions:

_____
_____
_____
_____
_____
_____

Please complete and turn into Cindy Golden.

Appendix C

Blank Form for Random Assignment of Task to Intervention

Subject	Random Assignment of Task to Intervention		
	Task 1 *Setting Table*	**Task 2** *Making Schoolbox Kits*	**Task 3** *File Papers*
A **J** **T**			

Appendix D

Random Assignment of Interventions to AM/PM Sessions by Subject

Subject ___	**Sessions**															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I_1 (MATERIALS)																
I_2 (MODEL)																
Control																

Subject ___	**Sessions**															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
I_1 (MATERIALS)																
I_2 (MODEL)																
Control																

Appendix E

Examples of Visual Support

Modeling Intervention

Materials Intervention

Appendix F

TASK 1 Data Collection Form – BASELINE Phase and CONTROL Task

Subject: _____ Staff taking Data: _____

Date _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial directive say "It's time to set the table"

Observe the Subject and circle "I" (Independent) if the subject completes the step and "No" if they do not.

Task 1 Setting the table	Is Subject Independent?		Comments
Get crate of materials from bookcase	I	No	
Place crate of materials on table	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout Placemat at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout plate at each place	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout cup at top right of plate	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout napkin at left of each place	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout fork on each napkin	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Layout spoon at the right of plate	I	No	
Put materials back in crate	I	No	

Appendix G

TASK 2 Data Collection Form – BASELINE Phase and CONTROL Task

Subject: _____ Staff taking Data: _____

Date _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial task directive say "It's time to make the boxes"

Observe the Subject and circle "I" (Independent) if the subject completes the step and "No" if they do not.

Task 2 Making School Box Kits	Is Subject Independent?		Comments
Get crate of materials from the bookcase	I	No	
Place crate of materials on table.	I	No	
Lay out pencil box	I	No	
Lay out pencil box	I	No	
Lay out pencil box	I	No	
Lay out pencil box	I	No	
Lay out pencil box	I	No	
Lay out pencil box	I	No	
Put pen in each box.	I	No	
Put pen in each box.	I	No	
Put pen in each box.	I	No	
Put pen in each box.	I	No	
Put pen in each box.	I	No	
Put pen in each box.	I	No	
Put Pencil in each box.	I	No	
Put Pencil in each box.	I	No	
Put Pencil in each box.	I	No	
Put Pencil in each box.	I	No	
Put Pencil in each box.	I	No	
Put Pencil in each box.	I	No	
Put eraser in each box.	I	No	
Put eraser in each box	I	No	
Put eraser in each box	I	No	
Put eraser in each box	I	No	
Put eraser in each box	I	No	
Put eraser in each box	I	No	
Put glue stick in each box	I	No	
Put glue stick in each box	I	No	
Put glue stick in each box	I	No	
Put glue stick in each box	I	No	
Put glue stick in each box	I	No	
Put glue stick in each box	I	No	
Put pencil sharpener in each box.	I	No	
Put pencil sharpener in each box.	I	No	
Put pencil sharpener in each box.	I	No	
Put pencil sharpener in each box.	I	No	
Put pencil sharpener in each box.	I	No	
Put pencil sharpener in each box.	I	No	
Put box of crayons in each box	I	No	
Put box of crayons in each box	I	No	
Put box of crayons in each box	I	No	
Put box of crayons in each box	I	No	
Put box of crayons in each box	I	No	
Put box of crayons in each box	I	No	
Put materials back in Crate	I	No	

Appendix H

TASK 3 Data Collection Form – BASELINE Phase and CONTROL Task

Subject: _____ Staff taking Data: _____

Date _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial task directive say "It's time to file the papers"

Observe the Subject and circle "I" (Independent) if the subject completes the step and "No" if they do not.

Task 3:Filing Papers	Is Subject Independent?		Comments
Get crate of materials from the bookcase	I	No	
Place crate of materials on table.	I	No	
Lay out folders	I	No	
Lay out folders	I	No	
Lay out folders	I	No	
Lay out folders	I	No	
Lay out folders	I	No	
Lay out folders	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put red paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put white paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put yellow paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put green paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put purple paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put gold paper in each folder matching letter on folder	I	No	
Put materials back in Crate	I	No	

Appendix I

TASK 1 Data Collection Form – Intervention, Probe and Best Alone Phase

Subject: _____ Staff taking Data: _____
Date _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial directive say "It's time to set the table"
Observe the Subject and circle the prompt that was required for completion of the step.
Circle "I" if the student was independent in completing the step with no prompt.

Task 1:Setting the table	Prompt Required					Comments
Get crate of materials from bookcase	I	V	G	PP	FP	
Place crate of materials on table	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout Placemat at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout plate at each place	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout cup at top right of plate	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout napkin at left of each place	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout fork on each napkin	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Layout spoon at the right of plate	I	V	G	PP	FP	
Put materials back in crate	I	V	G	PP	FP	

Appendix J

TASK 2 Data Collection Form – Intervention, Probe and Best Alone Phase

Subject: _____ Staff taking Data: _____

Date: _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial directive say "It's time to make the boxes"
Observe the Subject and circle the prompt that was required for completion of the step.
Circle "I" if the student was independent in completing the step with no prompt.

Task 2 Making School Box Kits	Prompt Required					Comments
Get crate of materials from the bookcase	I	V	G	PP	FP	
Place crate of materials on table.	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Lay out pencil box	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put pen in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put Pencil in each box.	I	V	G	PP	FP	
Put eraser in each box.	I	V	G	PP	FP	
Put eraser in each box	I	V	G	PP	FP	
Put eraser in each box	I	V	G	PP	FP	
Put eraser in each box	I	V	G	PP	FP	
Put eraser in each box	I	V	G	PP	FP	
Put eraser in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put glue stick in each box	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put pencil sharpener in each box.	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put box of crayons in each box	I	V	G	PP	FP	
Put materials back in Crate	I	V	G	PP	FP	

Appendix K

TASK 3 Data Collection Form – Intervention, Probe and Best Alone Phase

Subject: _____ Staff taking Data: _____

Date _____ AM_____ PM____ Mon__ Tues__ Wed__ Thurs__ Fri__

For the initial directive say "It's time to file the papers"
Observe the Subject and circle the prompt that was required for completion of the step.
Circle "I" if the student was independent in completing the step with no prompt.

Task 3 Filing Papers	Prompt Required				
Get crate of materials from the bookcase	I	V	G	PP	FP
Place crate of materials on table.	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Lay out folders	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put red paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put white paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put yellow paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put green paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put purple paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put gold paper in each folder matching letter on folder	I	V	G	PP	FP
Put materials back in Crate	I	V	G	PP	FP

Appendix L
Back of Data Collection Form

Key		
I	Independent	Subject uses the visual support to complete the step with only the initial verbal direction.
V	Verbal	Using a specific verbal directive ("Look at the picture") to prompt the subject to use the visual support
G	Gestural	Using a point or wave toward the photos in order to prompt the subject to use the visual support
PF	Partial Physical	Using a touch on the subject's arm/hand, in order to prompt the subject to use the visual support
FF	Full Physical	Using hand over hand with the subject in order to prompt the subject to use the visual support

Intervention 1: Photos of the materials only
Intervention 2: Photos of the subject doing the task
Task1: Setting the Table
Task 2: Making School Box Kits
Task 3: Filing Papers

Appendix M

Procedural Fidelity Checklist-Baseline Phase

Baseline Checklist

- ☐ All materials are organized and in location. The visual supports for each Intervention and Control tasks are in the area but not used during Baseline.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready for use.
- ☐ The staff member is positioned and prepared to collect data.
- ☐ The staff member working with the subject gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

Does Complete the Step w/in 5 second time frame	**Does NOT** Complete the Step w/in 5 second time frame
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame circle NO and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle NO and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.
☐ Circle *"I"* indicating independence and allow the subject to move on to the next step if he/she demonstrates the ability to do so.	☐ If the subject DOES NOT complete the step of the task within a 5 second time frame, circle NO and turn back to the subject and arrange the materials for the next step.
☐ The initial verbal directive can be given at each step.	☐ Turning back to the subject repeat the verbal directive.

Appendix N

Procedural Fidelity Checklist-Intervention Phase

Intervention Checklist

- ☐ All materials are organized and in location. If the task has been assigned as the Control, no visual support is used but continues to be in the vicinity of the work area. The visual support used for the Intervention is affixed to the wall above the work area.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready.
- ☐ The staff member is positioned and prepared to collect data.
- ☐ The staff member working with the subjects gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

If the subject DOES COMPLETE the step of the task	If the subject DOES NOT COMPLETE the step of the task
☐ Circle *I* indicating independence and let subject continue to next step without saying anything.	☐ Use *least to most* prompt levels (as indicated on the data sheets) until the subject completes the step. These prompts include: **Verbal, Gesture, Partial Physical, Full Physical.** There is a 5 second wait time between prompt and move to the next prompt. Wait for compliance until circling the prompt level required for compliance. Teach the task in four distinct steps: ☐ Say "Look at the pictures" ☐ Do the step ☐ Take the photo of that step from the visual activity schedule ☐ Place the photo in the pouch/basket ☐ After the completion of these four steps the subject can move onto the next step of the task.
☐ *The following verbal directive **can be** given at each step if the subject does not move on by himself "Look at the Pictures" while point to the photographic visual support.*	☐ If the subject completes the step wait to see if the subject moves to the next step by himself by looking at the visual activity schedule.

Appendix O

Procedural Fidelity Checklist-Probe Phase

Probe

Maintenance on tasks that reached criteria OR continued instruction using the less efficient intervention

- ☐ All materials are organized and in location. If the task has been assigned as the Control, no visual support is used but continues to be in the vicinity of the work area. The visual support used for the Intervention is affixed to the wall above the work area.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready.
- ☐ Staff member is positioned and prepared to collect data.
- ☐ Staff member working with the subjects gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

If the subject **DOES COMPLETE** the step of the task	If the subject **DOES NOT COMPLETE** the step of the task
☐ Circle *I* indicating independence and let subject continue to next step without saying anything.	☐ Use *least to most* prompt levels (as indicated on the data sheets) until the subject completes the step. These prompts include: **Verbal, Gesture, Partial Physical, Full Physical.** There is a 5 second wait time between prompt and move to the next prompt. Wait for compliance until circling the prompt level required for compliance. Teach the task in four distinct steps: ☐ Say "Look at the pictures" ☐ Do the step ☐ Take the photo of that step from the visual activity schedule ☐ Place the photo in the pouch/basket ☐ After the completion of these four steps the subject can move onto the next step of the task.
☐ *The following verbal directive **can be** given at each step if the subject does not move on by himself "Look at the Pictures" while point to the photographic visual support.*	☐ If the subject completes the step wait to see if he moves to the next step by himself by looking at the visual activity schedule

Appendix P

Procedural Fidelity Checklist-Best Alone Phase

Best Alone Checklist

- ☐ All materials are organized and in location. The most efficient Intervention visual will now be used to teach the task previously assigned as the Control. The visual support used for each specific Intervention task is affixed to the wall above the work area as the Intervention is implemented.
- ☐ Random selection of tasks and time of session has been completed prior to Baseline.
- ☐ Random selection of which subject will be first during the session has been completed.
- ☐ Correct data collection forms are selected for each subject are on clipboards and ready.
- ☐ The staff member is positioned and prepared to collect data.
- ☐ The staff member working with the subjects gives the verbal direction to begin the task (as indicated on the data collection form specific to the task).
- ☐ The staff member waits 5 seconds for a response from the subject.

If the subject **DOES COMPLETE** the step of the task	If the subject **DOES NOT COMPLETE** the step of the task
☐ Circle *"I"* indicating independence and let subject continue to next step without saying anything.	☐ Use *least to most* prompt levels (as indicated on the data sheets) until the subject completes the step. These prompts include: **Verbal, Gesture, Partial Physical, Full Physical.** There is a 5 second wait time between prompt and move to the next prompt. Wait for compliance until circling the prompt level required for compliance. Teach the task in four distinct steps: ☐ Say "Look at the pictures" ☐ Do the step ☐ Take the photo of that step from the visual activity schedule ☐ Place the photo in the pouch/basket ☐ After the completion of these four steps the subject can move onto the next step of the task.
☐ *The following verbal directive **can be** given at each step if the subject does not move on by himself "Look at the Pictures" while point to the photographic visual support.*	☐ If the subject completes the step wait to see if the subject moves to the next step by himself by looking at the visual activity schedule.

Appendix Q

Social Validity Survey

Name _____ ☐ Teacher ☐ Paraprofessional

Date _____ Person Completing the Survey_____

1= Strongly Disagree; 2= Disagree; 3= Neutral; 4 = Agree; 5= Strongly Agree

Questions		**Circle One**				
1	The dependent measures (ability to independently complete tasks) is an important skill in the life of the student.	1	2	3	4	5
2	The subject can do the dependent variable (ability to independently complete tasks) by himself well enough to get the desired effect and is that effect valued by others.	1	2	3	4	5
3	The intervention used is practical and cost effective.	1	2	3	4	5
4	The use of photographic visual supports could be easily implemented in the classroom in several different areas.	1	2	3	4	5
5	The results from the study provide important information for future research in the area.	1	2	3	4	5